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DIFFICULT LABOUR

DIFFICULT LABOUR

A GUIDE TO ITS MANAGEMENT

FOR STUDENTS AND PRACTITIONERS

BY

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WITH 162 ILLUSTRATIONS

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PREFACE.

EXPERIENCE as a practitioner and teacher of Midwifery, and as an examiner in that subject, has led me to think that a book was wanted which should give the reader more definite guidance in practice than he gets from some, in other respects excellent text-books of the present day. The learner finds in them many different things that he may do: but he is not always clearly told which is the best. I have tried to tell him as clearly as I can what I think the best way of dealing with each complication of labour, and why I think so. An experience in difficult labour larger than that of most persons, is my excuse for thinking myself competent to do this. I have not aimed at giving a full representation of all current opinions, nor at directing the reader to the original sources of information upon the facts described, although I have put a few references to papers of interest.

If the style of the book should seem unduly dogmatic, I would plead in extenuation the words of Bacon: "The manner of the tradition and delivery of knowledge, which is for the most part magistral and peremptory . . . . in a sort as may be soonest believed and not easiliest examined . . . . in compendious treatises for practice . . . . is not to be disallowed."

I have acknowledged in the text the sources whence illustrations have been borrowed, so far as I have been able to ascertain them. If this has been omitted in any case, it is from inadvertence, not from design.

I have to thank Dr. Cullingworth for the great service of reading the proof-sheets, and correcting many faults.

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DIFFICULT LABOUR.

CHAPTER I.

WHAT IS NATURAL LABOUR?

What is natural labour?—Various definitions have been given by different authors, which it is not necessary to quote and discuss. Labour is natural when the mother is in good health, and the pelvis is of not *less* than normal size; when the child is living and of not *more* than normal size; when the vertex presents, and the child's back is in front; when the membranes do not rupture until the os is at least three-quarters of its full size; when the placenta is implanted above the lower segment of the uterus, and is not detached until the child is born; when uterine contraction and retraction go on at such a rate that the child is born within twenty-four hours from the beginning of the labour pains, and continue after the child is born.

Importance of early diagnosis.—If these conditions are fulfilled, almost the only danger is that of septic infection; and the patient would do quite as well without a doctor as with one. But we can never foretell that all these conditions will be fulfilled, and, therefore, a woman who has not a skilled attendant with her in labour runs some risk. The mother can be safely delivered in spite of almost every complication that makes labour difficult if the abnormal conditions are recognised *early*, and the proper treatment applied in time. And with almost every complication labour is sometimes, if the other circumstances of the case are favourable, successfully terminated by the natural efforts.

Examples.—Thus, in the slighter forms of contraction of the pelvis, the danger to the mother, if the existence and degree of pelvic contraction are known at the beginning of pregnancy, or even at the beginning of labour, is no greater than if the pelvis were normal; but it is very much greater if the smallness of the pelvis is only discovered by the failure of prolonged attempts to drag the child through it. If the deformity be so great that Cæsarian section is required, the danger of this operation is not one-tenth as great, when done at a time appointed *before labour has begun*, so that preparation can be made and skilful assistance had, as it is when postponed until the patient has been exhausted by fruitless labour. Abnormal presentations can be easily set right at the proper time, but are very difficult of correction when that time has passed. The average death rate of placenta prævia, when properly treated, is only about five per cent.; but it is much higher when wrongly treated; and it cannot be properly treated unless the patient is seen early.

CHAPTER II.

DIFFICULT OCCIPITO-POSTERIOR POSITIONS.

The kind of difficulty that I shall first consider is that due to unusual positions of the child. I shall assume in the chapters relating to this kind of difficulty that everything but the position of the child is normal.

The exceptional position which deviates the least from the normal, is that in which the vertex presents, but the child's belly is turned forwards instead of backwards; in other words, *occipito-posterior positions.*

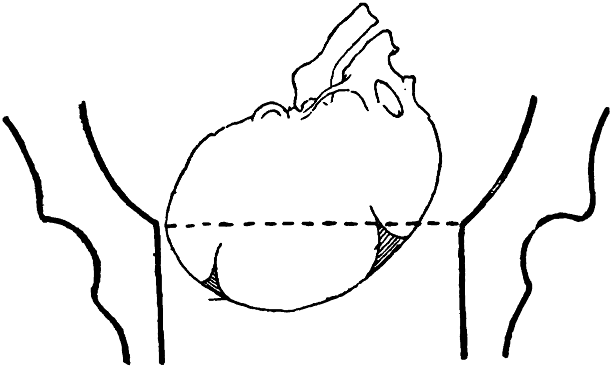

Fig. 1.—Bregmato-cotyloid Position: head flexed.

Easy and difficult occipito-posterior labour. —Cases in which the vertex presents with the occiput behind, are divided into two groups. In one, the larger, the head is well flexed, so that the anterior fontanelle, or bregma, lies opposite the acetabulum (Fig. 1). These cases are called *bregmato-cotyloid*, and are the favourable ones. In them the occiput comes down, it meets the resistance of the pelvic floor, and by this resistance is pushed forwards, so that it turns from opposite the sacro-iliac synchondrosis to under the pubic arch. Thus the abnormal position, with the occiput behind, is changed into a normal one, with the occiput in front (Fig. 2). When this rotation has taken place the labour ends just as if the occiput had been in front from the beginning; and no assistance is required except what may be called for by reasons other than the position of the child. Fortunately, the majority of cases of vertex presentation with the occiput behind, end in this way.

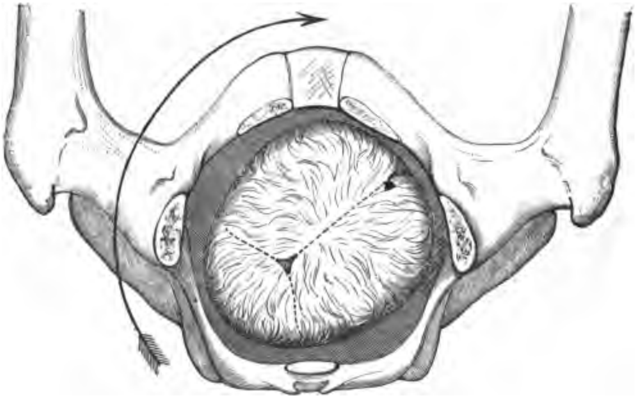

Fig. 2.—Showing the Rotation that should take Place in Occipito-posterior Positions.

In the other group of cases the head is not well flexed, and then, instead of the anterior fontanelle being opposite the acetabulum, the frontal eminence is opposed to it. These cases are called *fronto-cotyloid* (Fig. 3).

Why flexion is imperfect in occipito-posterior positions.—Extension of the head in occipito-posterior presentations comes about in two ways: first, (*a*) because the axis of the uterus and of the pelvic brim is concave behind; second, (*b*) because the greatest diameter of the head is behind its centre.

There are other causes of extension of the head, but they are not peculiar to the position with the occiput behind. They will be described under the head of face presentation.

(*a*) The child must accommodate its attitude to the space in which it lies. Because the axis of the upper part of the utero-pelvic canal is concave behind, when the back is in front the spine will be bent so that the child's abdominal surface, which is behind, may be concave. If the child lies with the abdomen in front, then accommodation to the cavity in which it lies can only be got by some extension of the spine (Fig. 4). If the extension of the spine is enough to bring the occipito-spinal joint in front of the line along which the propelling force acts, then this force will, unless opposed, produce full extension of the head.

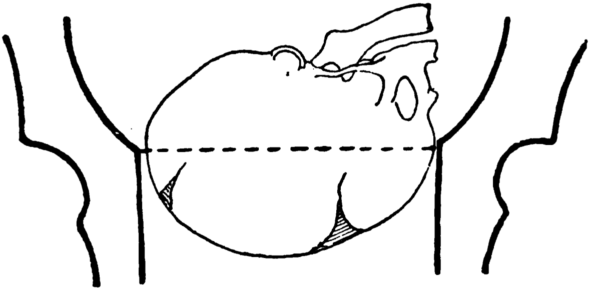

Fig. 3.—Fronto-cotyloid Position: the occipito-frontal diameter lying across the pelvis.

(*b*) The second reason why flexion is imperfect will be understood if you take the fœtal skull, and hold it in the pelvic brim in the first position, when you will see that the largest transverse diameter of the head, viz. the bi-parietal, lies exactly in the oblique diameter of the brim, where there is plenty of room for it (Fig. 5). Now turn it round, and hold it with the occiput behind, instead of in front. You will see that the bi-parietal, instead of being in the oblique diameter of the brim, is behind it, in a part of the pelvis where there is less room for it (Fig. 6). Hence, when the occiput is behind, it does not come down so easily as when it is in front, and its descent is likely to be hindered if the child be very large, or the pelvis rather smaller than usual.

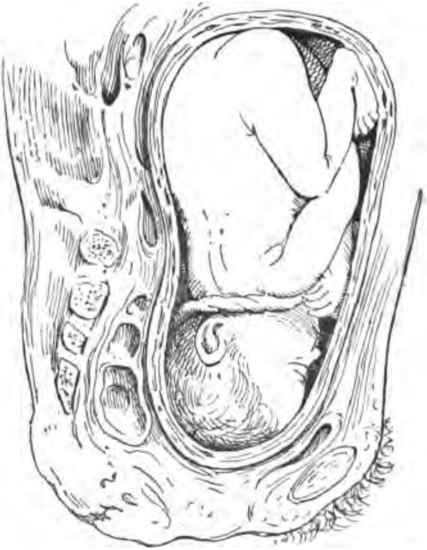

Fig. 4.—Taken from a Photograph of a frozen Section by Pinard and Varnier, showing Extension of the Spine when the Occiput lies behind.

This mode of production of extension does not come into play when the child is very small. On the other hand, in the case of very small children, the effect of extension of the spine in causing extension of the head is not opposed by the resistance of the pelvic bones, as will be explained in the next paragraph.

Results of extension.—If the head is only a little extended, a fronto-cotyloid position is produced. If the extension goes farther, a brow presentation. If it becomes complete, a face presentation. If the head has entered the pelvic cavity, the pressure of the pelvic walls prevents extension from going beyond a slight degree; for each increase in the amount of extension brings a larger diameter of the head across the pelvis. In a fronto - cotyloid position the occipito-frontal diameter ($4\frac{1}{2}$ inches) is the largest thrown across the pelvis; in the brow position the mento-vertical ($5\frac{1}{4}$ inches). The fronto-cotyloid can only become changed into a face position by passing through the brow position. But as the largest diameter of the pelvic cavity is only about five inches, this is impossible with a child of average size. But *above the brim* extension may and does go on to the production of face presentation.

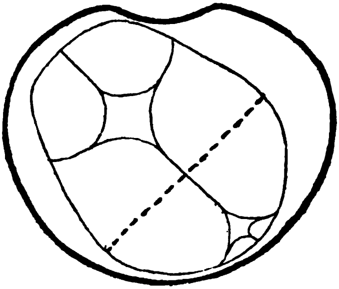

Fig. 5.—Head presenting at Brim; Occiput in front; bi-parietal Diameter lying in oblique Diameter of Pelvis.

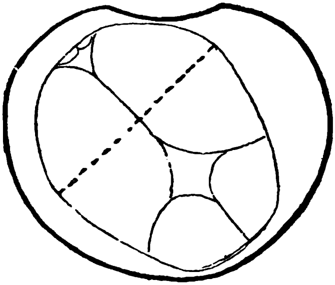

Fig. 6.—Head presenting at Brim; Occiput behind; bi-parietal Diameter lying *behind* oblique Diameter of Pelvis.

In the pelvic cavity, if the child be very small, an occipito - posterior presentation may be changed into a face position, and so delivered. This has been observed,* but, as will be understood from the reason given why it should not occur, it is very rare.

---

* "Caseaux," edited by Tarnier, tr. by Bullock, p. 325.

If the occiput does not rotate forwards, the uterus drives it down, and it revolves round the symphysis pubis, having the forehead as its centre of rotation (Fig. 7), and thus is born. Then the nape of the neck becomes fixed against the perineum, and the nose, mouth, and chin slip out from behind the symphysis pubis. This is the usual way, and with a full-sized child the only way, of delivery when the occiput does not rotate to the front.

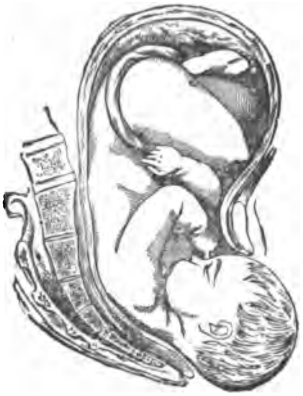

Fig. 7.—Showing Mode of Delivery when Occiput does not rotate forwards.

The head born with the occiput behind shows characteristic deformity. The occipito-frontal measurement is shortened, the vertical measurements are increased. The back and front of the head alike rise up steeply from the face and neck respectively.

On the average, labour with the occiput behind is longer than when the occiput is in front. Delivery with the occiput behind is especially apt to occur with very small or very large children. With small children extension can occur in the pelvis; with large, it is produced above the brim.

Cases in which treatment is required.—When the occiput is behind, labour is likely to be delayed because the occiput has to make a long rotation to get forward under the pubic arch. Although this rotation takes place in most cases, yet in some (about $1\frac{1}{4}$ per cent. of vertex presentations) it does not.

Then we get difficulty. If the child is not unusually small, or the uterus unusually strong, help will be needed. If the forehead remains in front, so that it becomes fixed behind the pubic arch, while the occiput passes over the perineum, the occipito-frontal diameter of the child has to pass the antero-posterior diameter of the pelvic outlet. Now as this diameter measures on an average four inches and a half, while the antero-posterior diameter of the outlet varies between four inches and four inches and a half, it will be clear that the head cannot pass easily, and perhaps may not be able to pass at all until it has been a good deal moulded.

The perineum is stretched more than it should be, for the diameter which should distend the perineum, the sub-occipito-frontal, only measures four inches, while here the perineum is stretched by the four inches and a half of the occipito-frontal diameter. Hence a bad rupture of the perineum is more likely to happen when the head is delivered in this position.

Treatment.—How is this difficulty best avoided or overcome?

1. **Preventive: Before rupture of membranes.**—The diagnosis of an occipito-posterior position ought to be made early, by abdominal palpation. Unless the patient be fat, or the abdominal walls rigid, it will be easy for you, if you have practised abdominal palpation as you ought to practise it, to find out that the abdomen is in front before the membranes have ruptured, and, if you have been called in time, before the dilatation of the os has begun. If, then, you are called to a case in which, on palpating the abdomen, in place of the broad, smooth convexity of the back, you feel the little movable knobs which the fœtal limbs feel like, at once turn the back forwards. Before the membranes have ruptured, this is easily done. Suppose that the child's belly looks forwards and to the left. Its anterior shoulder will be to the right and in front. Standing by the side of the patient, put your hands on the abdomen, the right hand behind the child's anterior shoulder, the left hand in

front of the posterior shoulder. Then, by a repetition of gentle pushing movements, push the anterior shoulder over towards the left side, and the posterior shoulder towards the right side. You will find it quite easy to move the child; only, as the pushes are given, not to the child, but to the uterus, part of their effect is to move the uterus. Each push moves the uterus as well as the child, and only slightly alters the position of the child in the uterus. But a sufficient repetition of these movements will, unless the liquor amnii be unusually deficient, or the child's mobility for some other reason be abnormally restricted, bring the back to the front. Then the labour may be left to take its natural course. You will sometimes find that this simple change in the position of the child will make a head which was above the brim quickly descend into it, press into the os uteri, and convert infrequent and feeble pains into strong and rapidly following ones.

2. **Head engaged in the pelvis.**—Supposing now that the case is not seen, or the diagnosis not made until the membranes have ruptured, the os uteri has become fully dilated, and the head is engaged in the pelvis. Wait for two or three hours after the full dilatation of the os, and longer if the pains are weak and infrequent, to see if the head will rotate naturally. Supposing it neither rotates nor advances, three courses are open—

A. To pull.
B. To flex.
C. To rotate.

A. **To pull.**—This course has the approval of a high authority—Robert Barnes.* The abnormal position causes increased resistance. Additional force is needed. Apply forceps; pull; take care not to hinder rotation, but leave the turns to nature.

This is in some cases good practice. If you are not called to a case till so late that when you first see it the caput succedaneum is so thick that you cannot feel the sutures and fontanelles, and the patient is so fat or is straining so that you cannot make a satisfactory diagnosis by abdominal examination; and on the other hand the head has sunk so far into the pelvis that it is clear that there is no obstruction at the brim, and your examination makes it certain that there is none at the outlet: in these circumstances the most comfortable advice, and the best practice, will be to apply forceps, pull, and leave the turns to nature (Fig. 8). But nature will not always turn the occiput forwards. I have known an hour's tugging with forceps

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* "Obstetric Operations," 2nd edn., p. 62.

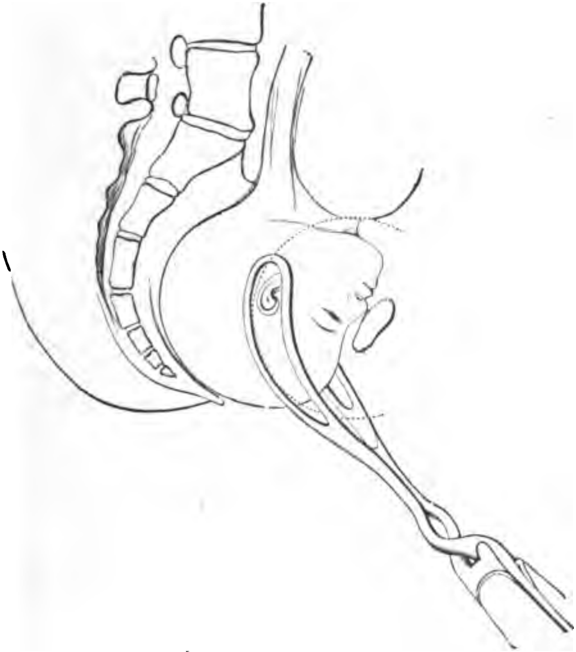

Fig. 8.—Showing Forceps Delivery with Occiput behind. (*After R. Barnes.*)

fail to deliver because the occiput was behind, and nature did not effect the turn. If you know the position of the head, there is a better practice.

B. **To flex.**—This is a more scientific mode of meeting the difficulty. It imitates the natural mechanism. When the head is well flexed, the occiput meets the resistance of the pelvic floor. The resisting parts are behind and at the sides. The occiput, therefore, turns forward, where the resistance is least. If the head is not flexed the occiput does not come down, does not meet this resistance, and does not turn forwards. If we can flex the head, the occiput will come down, and this natural mechanism will be brought into play. Flexing means bringing down the occiput, and from what has been said, it will be seen that this is often equivalent to overcoming the hindrance to delivery.

Methods.—There are two ways of doing this. The effect of one is only to flex. The other produces flexion and descent. First method, to produce *flexion.* Push up the forehead with one or two fingers, and in doing so, direct the pressure in such a way as to press the forehead not only upwards, but backwards, so as to favour both flexion and the turn of the occiput to the front. This is a mode of treatment which is harmless. The only objection to it is that it is generally ineffective, for what we want is descent of the occiput. We only value flexion as an aid to this. Second method, to produce *flexion and descent.* This is done with the vectis, an instrument like one blade of a pair of forceps, except that the tip of the blade is more sharply curved (Fig. 9). One blade of a pair of forceps may be used if the forceps has an exceptionally sharp curve; but the forceps best suited to the shape of the head cannot be so used, because the blade is not curved sharply enough. The vectis is introduced over the occiput, and with it the occiput pulled down, and at the same time forwards. This is undoubtedly an efficient way of procuring flexion and descent, and helping rotation forwards. Were this the only or the best way, it would involve loading the obstetric bag with an additional instrument. There is a better and simpler way. This is:

C. **To rotate.**—Put the left hand in the vagina, and the right hand on the abdomen. Suppose that the occiput is behind and to the right. The left shoulder will be in front and to the right. Put the right hand behind the left shoulder of the child. Grasp the head between the thumb and four fingers of the left hand, and, in the interval between two pains, turn the occiput forwards; at the same time, with the hand on the abdomen, pressing the shoulder forwards and to the left. If you can succeed in rotating the head and the shoulders, the head will stay in its new position. If your rotation of the shoulders is imperfect, when you take your left hand away the head will go back into its old position, or nearly into it. If you can easily rotate the head, but there is difficulty in getting the shoulders round, and the passages are healthy, hold the head in its new position, and apply forceps. I have repeatedly by this manœuvre easily effected delivery with forceps in cases in which prolonged ineffectual traction had been previously made.

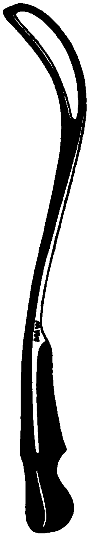
Fig. 9.—The Vectis. (*From Maw, Son and Thompson.*)

Forceps rotation.—It has been recommended to rotate with the forceps after the instrument has grasped the head. Smellie quaintly says that it gave him "great joy"* when he discovered this manœuvre. But it is not such good practice as rotating with the hand: for if you try and twist the head round with the forceps, one edge of the instrument is pressed strongly against the head, and the other raised off it. The edge pressed in may injure the scalp or skull, and the edge raised may injure the mother.

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* N. S. S. edition, vol. ii. p. 339.

It has been objected to the practice of rotation that the child's neck may be broken by it. It might, perhaps, if the shoulders were fixed, and the accoucheur were resolved at all hazards to get the occiput forwards, but it will not be broken by one careful not to use violence. Very little force is needed for rotation. The shoulders will, I believe, turn in utero before the neck will break. I have never known it happen, or read of its happening, and I think the objection is theoretical, not practical. The head will turn through three-eighths of a circle without dislocation, and this amount of rotation is enough for delivery.

CHAPTER III.

FACE AND BROW PRESENTATIONS.

Causes.—The causes of face presentation looked at broadly are as follows :—

1. The mechanical production of extension of the head by

   (*a*) The size of the pelvis.
   (*b*) The size of the head.
   (*c*) The position of the uterus.
   (*d*) The shape of the head.

2. Certain conditions which oppose normal presentations, but have no special tendency to make the face present.

3. Certain rare deformities of the fœtus; abnormalities of the cord; and abnormalities in the fœtal attitude.

1. (*a*) **The size of the pelvis.**—Contraction of the pelvis, either flattening, or general contraction of the pelvis (and probably other forms so much rarer that we have not enough observations about their effect on labour to enable anyone to speak from experience) often leads to face presentations.

Most face presentations are caused by conditions which prevent the occiput from getting easily into the brim. If the pelvis is contracted, so that there is not room enough for the bi-parietal diameter to descend easily into the pelvis, and thus the fœtal head is extended enough to get the occipito-vertebral joint in front of the line along which the uterine pressure acts, then the uterine action will extend the head more and more until a face presentation is produced (Fig. 10). It is not needful that the uterine contractions should be very strong. A small force often applied produces a great effect. Hence a face presentation may be brought about by the uterine contractions of pregnancy, before labour has begun. These, although not strong enough to make the head engage in the brim, may yet be enough to extend it. Therefore, sometimes the face presents at the very beginning of labour, before the head has entered the brim (Fig. 11). The uterine contractions which, so to speak, try to make the face enter the brim, may fail in this, but yet get it into the most favourable position for entering; and this, with a flat pelvis, is transverse—chin towards one side, forehead to the other. Therefore, with a face presentation thus lying, always suspect a flat pelvis. But any kind of contracted pelvis that does

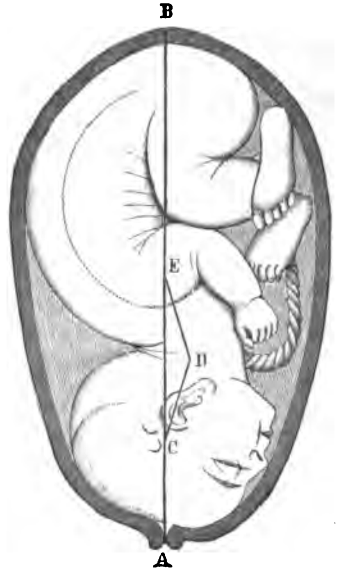

Fig. 10.—Showing how, when Extension of the Head has begun, Uterine Contraction increases it. (*After Schatz.*)

D, the joint between the spine and the head, is here *in front* of the line A B, along which the pressure of the uterus on the head and breech is exerted. Such pressure tends to make the angle E D C more acute; that is, to increase *extension*.

not allow the bi-parietal measurement to enter easily, may lead to a face presentation. Therefore, if the face is not lying transversely, do not conclude that there is no pelvic contraction.

(*b*) **The size of the head.**—The same thing may happen if the head is very large, although the pelvis is not contracted. Face presentations have been proved to be more common with very big children than with those of average size. The effect on labour of a very big child, the pelvis being normal, is the same as that of a generally contracted pelvis with a child of average size. Enlargement of the head from hydrocephalus will have the same effect.

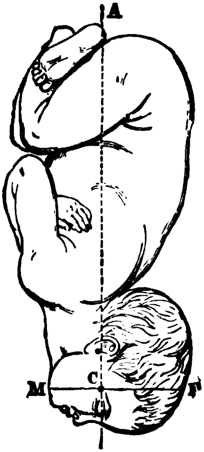

Fig. 11.—Attitude in Face Presentation, showing complete Extension of Head. (*From Galabin.*)

A C, Line along which expulsive force is transmitted; M F, fronto-mental diameter of head.

(*c*) **The position of the uterus.**—Uterine obliquity is a cause of face presentation, and some think it the most common cause. The obliquity consists in a deviation of the body of the uterus towards one side, and it most often is to the right side. If the body of the uterus is deviated to the right, the propelling force of the uterus, instead of acting downwards in the middle line, acts downwards and to the left. Hence it tends to push down more that part of the head which is turned to the left. If the occiput is to the left, the effect of this action is beneficial, by increasing flexion. But if the occiput is to the right, the effect will be to produce extension; and if the head be once so far extended that the occipito-spinal joint is in front of the line along which the uterine force acts, the effect of uterine contraction is more and more to increase extension till a face presentation is produced (Fig. 12).

The proof.—This theoretical explanation was given by the late Dr. Matthews Duncan. The correctness of his reasoning cannot be disputed. His view is supported by facts. For the common uterine obliquity is to the right, and therefore it is in positions in which the child's back is to the right that, if the theory be true, we should expect face positions to be produced. Now, in face presentations, positions with the back to the right are nearly as common as those with the back to the left, while in vertex presentations the back is three times as often to the left as to the right.

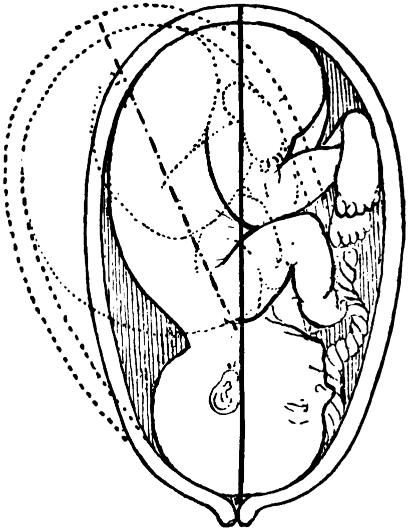

Fig. 12.—Showing the Effect of Uterine Obliquity in causing Face Presentation.

The continuous outline shows the uterus vertical, the child's head in a position midway between flexion and extension; the line along which the uterine pressure is exerted passing through the occipito-spinal joint. The dotted outline shows right lateral obliquity of uterus, the broken line indicating the line along which the uterine pressure now acts. The occipito-spinal joint is now in front of this line, and therefore it tends to extend the head more and more.

Practical application.—It follows from this reasoning that the way to prevent or undo face presentation caused by uterine obliquity, is to put the patient on the side opposite to that towards which the fundus uteri is deviated, so as to undo the obliquity. But this can only be effective if done quite early. When complete extension has been produced, change in the patient's position will not undo it. Nor will uterine obliquity produce a face presentation after the occiput has become well flexed and engaged in the brim. It will only do so while the head is above the brim, and in a position nearly intermediate between flexion and extension.

Relation to other complications.—Uterine obliquity is favoured by conditions which prevent the head from engaging in the pelvis. Hence, uterine obliquity and pelvic contraction often exist together; and so do uterine obliquity and excessive size of the child: all conditions that favour face presentation.

(*d*) **The shape of the head.**—Face presentation has been thought due to unusual length of the head—*dolicho-cephalus*. There is no doubt that in children born in face positions, the head is longer than in most children. But this is from moulding during labour. The lengthening does not always go quite away after delivery, and for this reason it has been thought that it must have been present before labour. But deformities of the head produced by other modes of delivery often persist in a small degree throughout life, and therefore the elongation produced by face delivery may do so. If the lengthening of the head were a peculiarity in shape present before labour, it must be an inherited peculiarity; and if this were so, we should expect face presentations to show a tendency to recur over and over again in the same mother; and this has not been shown to be the case. A few heads have been measured, not born in face positions, in which the back of the head was longer in proportion than usual, and therefore its occasional occurrence must be admitted. Further, in heads so shaped that the hinder half is the larger, the coronal and lambdoidal sutures run more backwards than usual, so that the parietal bones are nearer the rhomboidal than the oblong shape, and the posterior inferior (or mastoid) angle of the parietal bone is larger than it usually is. Hecker found that in children born with face presentation the average magnitude of this angle was larger than in those born with the vertex presenting. This is a peculiarity which could not possibly be produced by moulding during delivery. I think, therefore, that while lengthening of the head in face presentations is often entirely due to moulding, and is generally increased by it, yet it is not always due to it, and has some influence in the production of face presentations.

Mode of action.—It is said that when the head is too long, the part behind the occipito-spinal joint is as long, or longer, than the part in front of it; and thus, one of the mechanical conditions that usually favour flexion is absent, or the shape of the head may even favour extension.

2. **Conditions which hinder normal presentation.**—The conditions which, by hindering normal presentation, favour malpresentations of all kinds, face included, are:—(*a*) *Excess of liquor amnii.*—When there is so much liquor amnii that the child floats freely in it instead of getting engaged in the pelvic brim, it may happen that when the membranes break, the child is in such a position that its face comes down into the os uteri. But there is no reason that we know of why the child's face should under such conditions be the part to come into the brim; and face presentations produced in this way are very rare. (*b*) *Dead children.*—In the case of decomposing children, the tonicity of the muscles which helps to maintain the fœtal spine bent, and to keep the chin bent, is absent, and therefore extension is more apt to occur than with living children. (*c*) *Twins.*—In twin pregnancies abnormal presentations are common, because both children cannot get engaged in the brim. Face presentations are thus more common than in natural

labour, but they are not more likely to occur than other malpresentations.

3. **Rare conditions of the fœtus.**—There are some conditions of the fœtus which undoubtedly may produce face presentations. *Enlargement of the thyroid gland* may form such a lump in front of the neck as to prevent the child from bending its head. If the *cord* be rendered *short* by being coiled round the child's neck, and the child lies facing the placental site, the neck may be so pulled forward as to extend the head. It is said that absolute shortness of the cord, without coiling, may so pull the belly forward as to extend the head; but such shortness as this is excessively rare, if it ever occur. In *anencephalous monsters*, in which there is no cranial vault, the face often presents. Abnormal *rigidity of the extensor muscles* of the neck has been described as a cause of face presentations. This is very rare, and we know nothing as to why it should occur. If present it would account for the face presenting. *Prolapse of the hand or foot* by the side of the head may prevent the vertex from engaging in the brim and bring about a face presentation.

Treatment of face presentations.—If it be possible to change the face presentation into a vertex, this should be done. But it is not always possible. It is impossible when the head has descended into the pelvic cavity, because during the change of position the maximum diameter of the head must for a time lie across the pelvis. As this diameter in a child of average size measures five inches and a quarter, while the largest diameter of an average pelvis does not exceed five inches, this cannot take place. If the child be so small that its maximum diameter can pass through the pelvis, labour will be so easy that there is no need for interference. It is impossible to change the position when the presentation is produced by a condition of the fœtus which prevents flexion. It is practically impossible when the presentation is produced by contraction of the pelvis or the very large size of the child's head: because then, although it may be possible to get the vertex to present at the brim, it will be very difficult to get it to stay there. Change of position is possible, but difficult, after rupture of the membranes.

How to change a face presentation into a vertex.—There are two ways: one by pressing on the face and the occiput; the other by pressing on the shoulders and breech.

1. Put two fingers in the vagina, and the other hand on the abdomen. In most cases the occiput can be felt quite easily, separated from the back by a deep sulcus. Press the face up, either by pressure first on the jaws, and then on the forehead, and at the same time press the occiput down (Fig. 13). If you have succeeded in pressing the forehead above the pelvic brim, then use both hands outside, with one hand pressing the occiput deep down into the pelvis, with the other pressing the face upwards and towards the middle line. No harm will come from trying to do this, even if it does not succeed.

2. The other method (known as Schatz's) is by pressing the shoulders towards the dorsal aspect of the child, so as to undo the extension of the spine which is the accompaniment, and sometimes the cause, of face presentation. Place the two hands on the abdomen, get them if possible below and in front of the shoulders; press the shoulders and chest of the child upwards, and to the side to which the child's back is turned (Fig. 14). If the child's back is behind, at the same time turn it forwards. If you can succeed in this, and have raised the shoulders, press them up with one hand, while with the other you press the breech first in the opposite direction and then downwards, so as first to bend the spine and then press it down (Fig. 15). If you can succeed in undoing the extension of the spine, the downward pressure will flex the head (Fig. 16). This manœuvre is harmless, but may fail.

Rules for management of unreduced face positions.—If you have not succeeded in changing the face presentation into a vertex, or if you are not

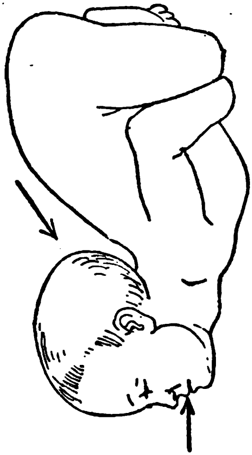

Fig. 13.

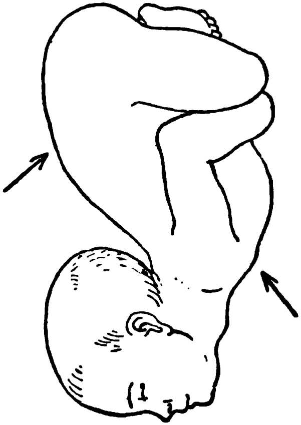

Fig. 14.

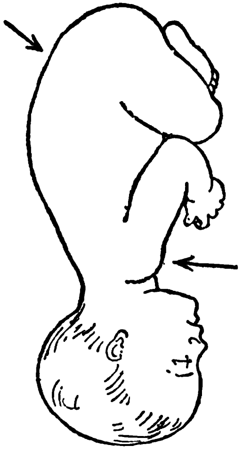

Fig. 15.

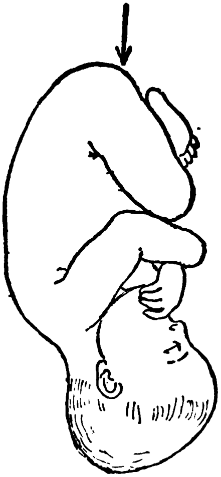

Fig. 16.

Fig. 13.—Showing Mode of rectifying Face Presentation by pressing the Face up and the Occiput down.

Figs. 14–16.—Showing Schatz's Method of rectifying Face Presentation.

called until it is too late to attempt it, the case should be managed according to the following rules:—

1. *The head is above the pelvic brim; the os uteri is not fully dilated; the bag of membranes is entire.* Do nothing, except direct the patient to avoid everything which is likely to cause rupture of the membranes. The bag of membranes will dilate the cervix better than anything else.

2. *The os uteri is not fully dilated, and the membranes are ruptured. The face with each pain comes down and engages in the os*, putting it on the stretch. Let it alone: the face will dilate the os better than any artificial means.

3. *The membranes are ruptured, but the head is not coming down into the os* to dilate it; it is detained above the brim. Probably either the pelvis is contracted or the head is too large. If the os will admit the hand, perform podalic version, bringing down one leg. If it will not, act according to the condition of the patient. If the pains are infrequent and the pulse slow, wait till the os will admit the hand. If the pains are frequent, the patient getting tired, and the dilatation being evidently retarded by the absence of any dilating agent, put in Champetier de Ribes's dilating bag, and when this has dilated the os uteri, bring down a foot and deliver.

4. *The os is fully dilated, the head is in the pelvic cavity, the chin is in front*, the second stage has not lasted two hours. Leave the case to nature. If, regular and frequent pains being present, the head is not delivered within two hours, help delivery with forceps.

5. *The os is fully dilated, the head sunk low in the pelvic cavity, but the chin is behind.* If the second stage has not lasted two hours, leave the case alone, in the expectation that the chin will rotate to the front (Fig. 17). If within two hours, after full dilatation of the os, notwithstanding regular and frequent pains, the chin has not turned forwards, turn it to the front, and deliver with forceps. Put the left hand in

the vagina, the right hand on the abdomen. Grasp the face with the thumb and four fingers. Turn it round by the shortest route so as to bring the chin to the front (Fig. 18). At the same time, with the hand on the abdomen, press the anterior shoulder in the same direction. If the chin points directly backwards, observe in which oblique diameter the shoulders lie, and move the chin in the same direction as that in which you press the anterior shoulder to get it to the front. When you have brought the chin to the front, apply forceps and deliver.

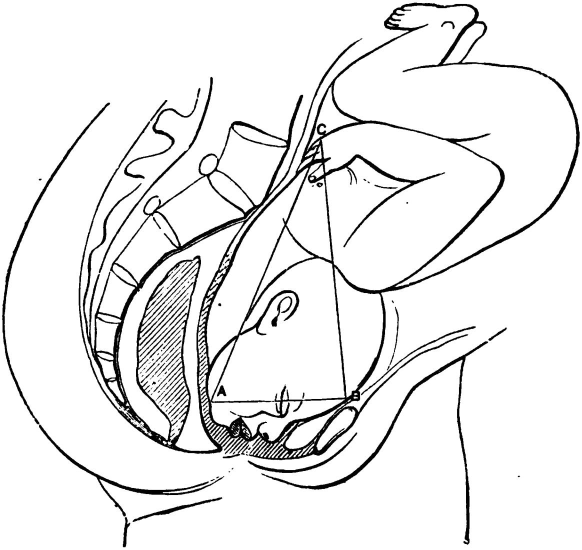

Fig. 17.—Face sunk down into Pelvis with Chin behind: wedge-like blocking of brim of pelvis by cranium and chest. (*After R. Barnes.*)

A B C, Wedge formed by head and upper part of chest. (N.B. This can only happen with a small child.)

If by the measures described in the foregoing paragraphs delivery cannot be accomplished, perforation is the only resource.

Brow presentations.—If the mechanical conditions which produce extension of the head have not had their full effect (so as to produce a face presentation), the head may be incompletely extended, and so present with the brow. In this position the middle of the frontal suture, or a point near it, lies over the os uteri, and the points opposed to the pelvic walls are the lower jaw on one side and a point near the middle of the sagittal suture on the other. The maximum diameter, the mento-vertical, or one as near it as the size of the pelvis will admit, is engaged in the brim, and has to pass through the pelvis if the head is to be born in this position. Now as the maximum diameter of the head averages five inches and a quarter, while the largest diameter of the pelvic cavity only averages five inches, it is clear that it is not possible for a child of average dimensions to pass through the pelvis in this position, unless the head is greatly moulded, so that its maximum diameter is considerably reduced.

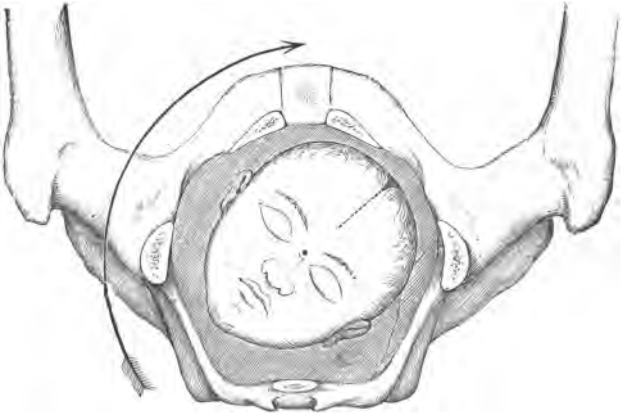

Fig. 18.—Showing Rotation of Chin forwards which should take place when the Chin is behind. (*After Farabeuf.*)

Sometimes this happens. The head is driven down into the pelvis with the brow in advance. The jaw (not the forehead, as in occipito-posterior cases) is fixed behind the pubes, and the head rotates round the jaw as a centre, the whole length of the sagittal suture, but especially its posterior half, being powerfully compressed and flattened down towards the neck, as the head passes through the pelvic outlet. The head may also be delivered with the jaw behind, the parietal bones being flattened behind the pubic symphysis. Delivery in the brow position is slow, and requires great force: either powerful uterine action, or uterine action aided by powerful pulling with forceps. Natural delivery is generally impossible.

Treatment.—1. The first thing is to *change the brow presentation*, if possible, either into a vertex or a face presentation. Before rupture of the membranes, employ the same external manœuvres to undo extension as have been recommended for face presentation. If these fail, and the membranes have ruptured, push up the forehead, and thus try to get the head flexed. If you cannot do this, push up the occiput, so as to try and get the chin down. The effect of upward pressure will be helped by letting the woman lie on the side opposite to which lies the part that you wish to descend. This will favour uterine obliquity towards the side on which the patient is lying; and if the uterus become oblique, its action will have a greater tendency to push down the end of the fœtal head towards which the line of uterine action points. These manœuvres are harmless. The objection to them is that they often fail. Brow presentation, like face presentation, is often the result of causes that lead to extension of the head, and so long as these causes continue to act, the brow presentation will be reproduced as soon as the upward pressure is left off. Consider now what to do if your attempt to change the brow position into one of the face or vertex fail.

2. If *the head is above the brim*, the os uteri fully, or nearly fully, dilated, and in the intervals between the pains the uterus relaxed, the best practice is to turn, and bring down one foot.

By turning you ensure that the head enters the brim in a favourable position. You incur the danger of fœtal death from pressure on the cord, but this risk is preferable to that which mother and child will incur from protracted labour if you leave the head in its very unfavourable position.

3. If *the head has been driven down into the pelvic cavity, and is there arrested*, and the uterus is acting vigorously, it will be impossible, without great risk to the mother, to force the head up out of the pelvis and get a foot down. If the pains have not been unusually strong, and the second stage of labour has not lasted long, and yet the head has advanced into the cavity, the probability is that the child is not very large, and that you will be able to deliver with forceps. Therefore, apply forceps and pull. If the pains are very vigorous, and the second stage has lasted more than two hours, you will very likely fail. If after a good pull with forceps you have not made the head advance, perforate.

If the uterus has passed into a state of *tonic contraction*, and the head is still above the brim, do not run the risk of rupturing the uterus by trying to turn, nor waste time and the mother's strength by a fruitless effort at forceps delivery, but perforate at once. If the head is low down in the pelvic cavity, try forceps, but if you cannot deliver quickly, perforate.

CHAPTER IV.

THE MOULDING OF THE HEAD.

It has been mentioned in the foregoing pages that, in difficult labour, the head becomes moulded. Consider now the ways in which it is moulded in the different positions.

The moulding of the head.—In any head first labour that is at all difficult, the long squeeze that the head suffers in passing through the pelvis alters its shape. This change in shape is partly undone during the first day or two by the elasticity of the bones; but if great, is never entirely lost. In the different positions, the direction of the greatest squeeze is different, and hence the shape of the head often tells the way in which a person came into the world. In the following descriptions I only mention the changes that are characteristic.

Vertex presentations, occipito-anterior.—In the vertex positions with the occiput in front, the sub-occipito-frontal diameter is the one most compressed. The frontal and occipital bones are overlapped by the parietal bones, and the posterior-lying parietal bone overlapped by the anterior. The squeezing force is applied to the nape of the neck and the frontal bone (Fig. 19). Hence the head is elongated in the mento-vertical direction, and the forehead is made to retreat. A long head with a somewhat retreating forehead is the result.

Occipito-posterior.—In vertex presentations with the occiput remaining behind, the squeeze is applied to the forehead in front and the occiput behind: the head is compressed in the occipito-frontal diameter (Fig. 20). Hence this head, looked at from the side, is squarer than usual; the forehead rises up steeply in a line with the face, and the occiput rises steeply

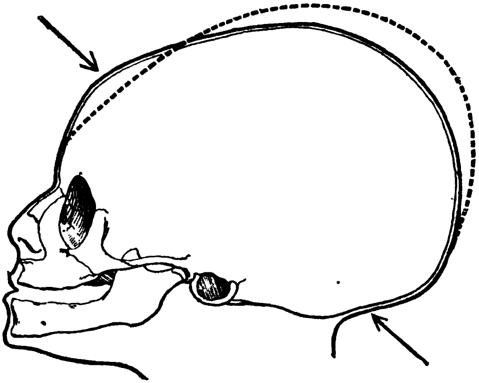

Fig. 19.—Diagram showing the Direction of greatest Squeeze in Delivery with Vertex in advance and Occiput in front; head compressed in sub-occipito-frontal diameter.

in a line with the back of the neck. The height of the top of the cranium above the ears is increased. But in some cases, although the occiput remains

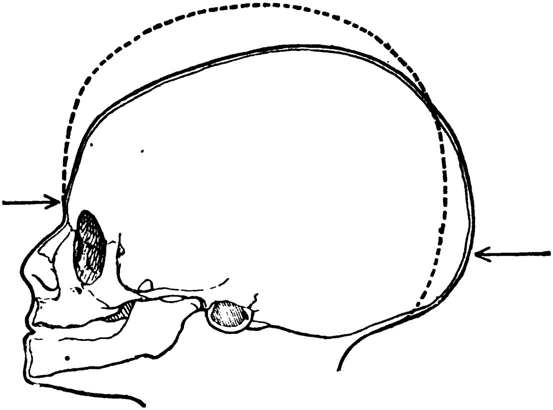

Fig. 20.—Diagram showing the Direction of greatest Squeeze in Delivery with Vertex in advance and Occiput behind: head compressed in occipito-frontal diameter.

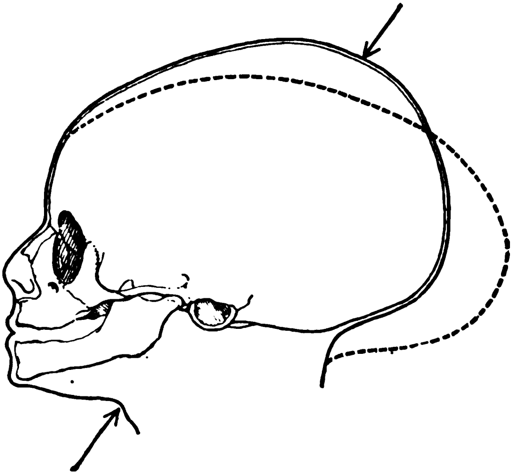

Fig. 21.—Diagram showing the Direction of greatest Squeeze in Delivery with the Face presenting: head compressed in cervico-vertical diameter.

behind, there is such extreme flexion that the anterior fontanelle, or a point, near it gets behind the symphysis. The head is then compressed in the sub-occipito-frontal, or even sub-occipito-bregmatic

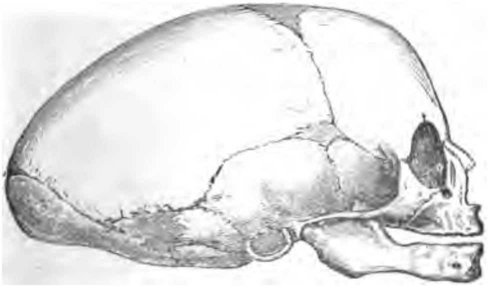

Fig. 22.—Drawing of an actual Skull after Delivery with the Face in advance. (*After Fritsch.*)

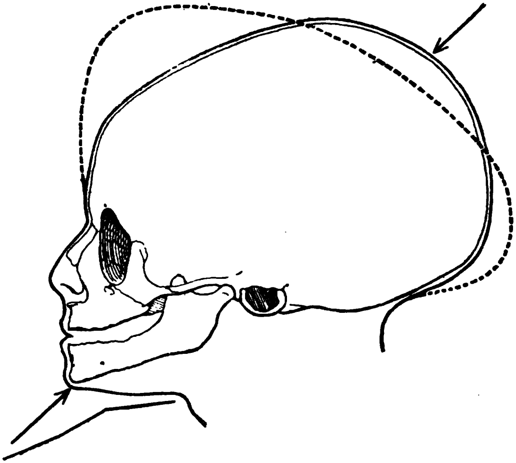

Fig. 23.—Diagram showing Direction of greatest Squeeze in Delivery in Position of Brow Presentation: head compressed in vertico-mental diameter.

diameter, and presents a high degree of the same kind of moulding as takes place in occipito-anterior

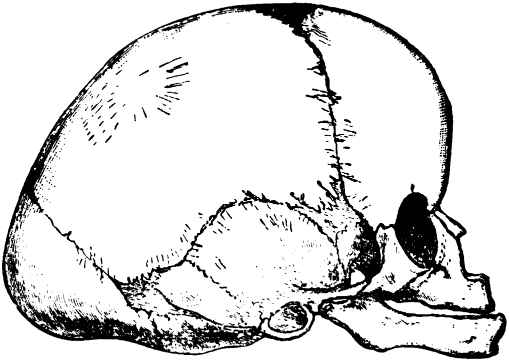

Fig. 24.—Drawing of an actual Skull after Delivery in Position of Brow Presentation. (*After Küstner.*,

deliveries. The moulding is great, because, owing to the difficulty of delivery, compression lasts long. I imagine that as the occiput is driven down the forehead slips up, from the flexion produced by the application of the driving force, acting through the fœtal spine, behind the centre of the head; but I know not that the mechanism has been observed.

Face presentations.—When the head is delivered face first, the front of the neck is fixed against the anterior pelvic wall, and the two parietal bones are pressed down against the neck and shoulders. Hence the head is elongated in the mento-vertical direction. But instead of the frontal bone being the one chiefly squeezed, as in vertex presentations, the squeezing is applied all along the sagittal suture (Fig. 21). The cervico-vertical diameter is the one most compressed. Hence the forehead is not retreating, but the head is lengthened and the top of the head flattened all the way along (Fig. 22).

Brow presentations.—When the head is delivered in the brow position, the jaw is fixed behind the symphysis. The maximum diameter, the mento-vertical, is brought into the antero-posterior diameter of the pelvic outlet; and the head can only get out by compression of this diameter (Fig. 23). Hence the head delivered in the brow position has the forehead running straight up, and the line of the sagittal suture running down flat to the occiput, which is lower than usual (Fig. 24).

CHAPTER V.

PELVIC PRESENTATIONS.

Kinds of pelvic presentations.—When the pelvic end of the child presents, (1) the thighs may be bent up close to the abdomen, and the knees bent so that the heels are close to the buttocks. This is the best position, because in this position of the legs the pelvic end of the fœtus is larger, and dilates the passage more. (2) The legs may be extended, so that the feet are near the head. (3) One or both feet or knees may come down and present at the os, or come down through it into the vagina. In essential points the management of delivery is the same, although each different form of pelvic presentation brings with it a liability to special forms of difficulty.

Causes.—Foot and knee presentations are apt to occur rather than breech, when the *position of the fœtus* was at the beginning of labour *oblique.* In an oblique position of the child it depends upon which pole of the fœtal ovoid lies the higher, whether the arm or the foot comes down. If the head end is lower, the shoulder presents and an arm comes down. If the breech end is lower, the breech occupies an iliac fossa, and probably a foot or knee will present (Fig. 25). Therefore the causes which favour transverse presentations also favour knee and footling presentations. In contracted pelvis foot presentation is more common than breech.

Pelvic presentations are frequent with *premature and dead children,* because in them the specific gravity of different parts of the fœtus is altered, so that gravity no longer steadily favours the presentation of the head. About one in five premature children present by the breech.

Pelvic presentations are favoured also by all conditions which prevent the head from being engaged in the pelvis; among these are *too much liquor amnii*, which gives the fœtus too much liberty to move, and *contracted pelvis*, which prevents the head from getting into the pelvis. Pelvic presentations occur in about three per cent. of labours with normal pelvis, and about twice as often in labours with contracted pelvis.

In *twin pregnancy* breech presentation is common, for the evident reason that two children are more easily accommodated *in utero* if the large end of one fits opposite the small end of the other. Of twins, about a quarter present with the breech.

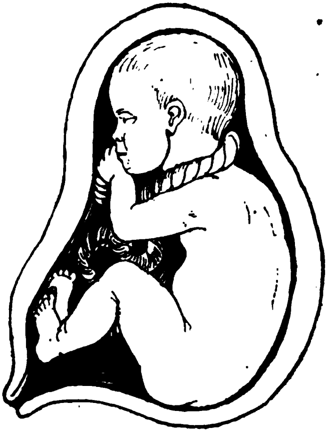

Fig. 25.—Diagram showing how Obliquity of the Uterus produces Footling Presentation. (*After Küstner.*)

The more widely the conditions upon which the presentation depends depart from the normal, the more they tend to produce footling rather than breech presentations; for the conditions which, when the head is lying lowest, favour its engagement in the brim, if the pelvic end lie lowest, favour the engagement of the breech in the pelvis.

Prognosis in breech presentations.—Taking the average of all cases together, statistics show that labour with breech presentation is shorter than labour with the head presenting. The comparative average shortness of labours with pelvic presentations is because every collection of such cases comprises a large number of premature children. Taking only labours at term, breech labours are on an average a trifle longer than head first labours. The prolongation of labour occurs chiefly in first labours, and in the second stage; the breech does not stretch open the soft parts of the pelvic floor so well as the head. In the first stage of labour, and in the second stage of labour when the patient is not a primipara, there is but little difference.

Injuries to the maternal parts—the perineum, vagina, and cervix uteri—are less likely to happen in breech presentations that are let alone than in head presentations, because in the former the soft parts are dilated more gradually. They are not found less frequent in actual practice, because they are often produced by manipulations designed to assist delivery. If the head is detained by the imperfectly dilated cervix, laceration of the cervix will be a probable result of hasty delivery.

Dangers to the child.—The *prognosis for the child* is distinctly worse than in head presentations. At least 1 in 10 are still-born; probably about 1 in 7; in some charities as many as 1 in 3. The difference depends upon skill in management. Fœtal death takes place:

1. *From pressure on cord.*—The death is due to asphyxia, from the stoppage of the circulation by pressure on the cord. This pressure is not great enough to be hurtful while the trunk is entering the genital passage. But when the child is born as far as the navel, then the genital canal is filled first with the chest and arms, and then with the head of the child; and the cord is compressed between them and the pelvic wall. As the head is hardest, and most completely fills the canal, pressing uniformly on it all round, the pressure is most dangerous when the head is engaged in the pelvis. The larger the child the earlier will the pressure on the cord reach a dangerous degree. The danger is greatest in foot presentations; least when the breech presents and the knees are bent, for in the latter case the cord may lie protected by the legs.

2. *From premature inspiration.*—There is another

way in which death from asphyxia is likely to happen, and some think it happens oftener from this cause than from pressure on the cord. The contact with the cold air of the skin of the part of the fœtus that is born provokes inspiration, and as the mouth and nose are still in the passage, instead of air being inspired, mucus is sucked in, which clogs the air-passages of the child and suffocates it.

3. *From separation of placenta.*—Another reason is given why the child is in peril, which is, that the diminution in size of the uterus lessens the supply of maternal blood, and therefore of oxygen, to the placenta, and even that it separates the placenta; and thus fœtal asphyxia is the result. This is theory. It may be true, but has not been proved. It is quite certain that the uterus may be quite empty and contracted without separating the placenta; much less then does contraction only to the limit which the presence of the fœtal head in the uterus allows, necessarily involve separation of the placenta. There is no proof that the supply of maternal blood to the placenta is lessened when the uterus gets smaller; or if lessened, that it is lessened to a degree which endangers the child.

Management of breech presentations: first stage.—If the *membranes are unruptured,* do not interfere in any way with the mechanical conditions present. The bag of waters will dilate the cervix better than anything else. Keep the membranes unruptured as long as you possibly can. If the bag of waters appears at the vulva, in this case so much the better. The passages will be well dilated, the circulation through the cord will be maintained, and the head will be easily delivered.

If the membranes rupture before full dilatation of the os, there may be difficulty in the birth of the head, for the following reason. The trunk, being smaller than the head, can come through the os before it is quite fully dilated; especially if the arms do not descend folded on the chest. Then the delivery of the head is retarded, because its base is embraced by the imperfectly dilated cervix. This kind of difficulty is more likely to happen in footling presentations than in breech. It is commoner also in premature labours than in labours at term; for in premature children the head is larger in proportion to the body than in labour at term. It is favoured by untimely pulling: for if you pull on the legs while the advance of the chest with the arms folded in front of it is hindered by the smallness of the os uteri, you will pull the chest down, and the arms, if they do not descend with it, will come to be by the side of the head.

If the membranes *have* ruptured before full dilatation of the cervix, do not interfere unless it is clearly necessary. The best practice in foot presentation here differs from that in breech presentations. If *the feet* present, the condition will not be made worse by bringing down one foot, and as this will give the best means of traction in case of need, draw down one foot, choosing the anterior if you can feel both (Fig. 26). But do not do more: do not pull on it in the early part of labour.

If *the breech* is presenting, and is pressed into the os with each pain, leave the case alone until the dilatation of the os is complete. The breech is the next best dilator to the bag of membranes; and after dilatation of the os, will descend into the pelvis unless either the pelvis is contracted or the child very large.

Second stage: when to bring down a leg.—Watch the progress of the case carefully, and if the breech does not within an hour or two after the os is fully dilated descend into the pelvis, it is either (*a*) because the pelvis is contracted, (*b*) the child very large, or (*c*) the pains very feeble. If the pains are frequent and strong, examine carefully the size of the pelvis, and form an opinion by abdominal palpation as to the size of the child. If (*a*) the pelvis be contracted, or if (*b*) the child seem to be very large, bring down one leg. By postponing the bringing down of the leg till the second stage of the labour, you get the advantage that the os is better dilated by the whole breech than by the half breech. The lower uterine segment will not within an hour or two after dilatation of the os have become so thinned as to make it dangerous to put the hand into the uterus. If the pelvis is normal, and the child not excessive in size, the only hindrance that can occur to the advance of the breech is from (*c*) the pains not being strong enough. If this is the only cause of delay, such additional force as can be applied with the fingers will probably be enough, and, by leaving the legs in contact with the abdomen, you protect the cord.

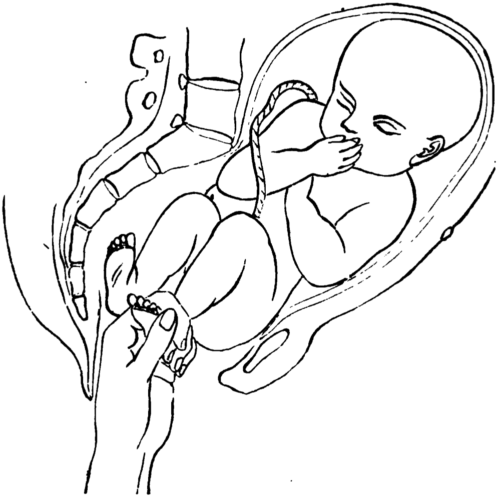
Fig. 26.—Bringing down one Foot. (*After R. Barnes.*)

If a loop of the cord has already come down, the cord has lost the protection which the presence of the bent-up legs would have given it, were it *in utero.* Here, then, the child's chances of life will not be made worse by bringing down one leg; on the contrary, they will be improved, because you will be better able to deliver quickly, should the child's life be in danger. Therefore, if the cord come down, bring down one leg. There are thus three indications for bringing down a leg early in the second stage of labour in a breech case: a large child, a small pelvis, prolapse of the cord.

How to bring down a leg.—Give chloroform if you have it with you; but it is more important that the operation should be done at the right time (that is, before all the liquor amnii has escaped, and the uterus is contracted round the child) than that the patient should be anæsthetised. Pass up your hand, lubricated with sublimate glycerine, with its palm towards the child's abdomen. Use the hand the palm of which will most naturally face the fœtal abdomen. Support the uterus with the other hand on the fundus externally. The anterior foot is the one to take. When you reach the knee, press it outwards and backwards: the tension so caused of the flexor muscles will tend to bend the knees. Pass your hand

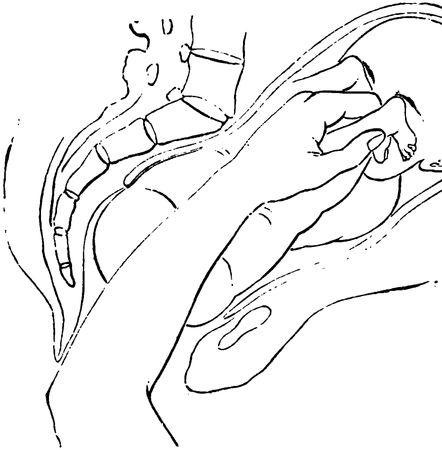

Fig. 27.—Bringing down a Leg. (*After R. Barnes.*)

up farther, and seize the ankle (Fig. 27). Draw it down so as completely to flex the knee, and then extend the thigh and so bring it out of the uterus. Do not try to pull it down by pulling on any part of the limb except the ankle.

Delay from weak pains with breech presentations.—Suppose now that the breech is engaged in the pelvic cavity, but its progress is slow. The second stage has lasted two hours, the pains are regular, but the perineum is so little stretched by each pain that delivery does not seem at hand. Abdominal examination shows that the child is not of excessive size.

Is there in such a case any danger in delay? There may be great danger to the child, for even without the breech descending into the pelvis, the liquor amnii will slowly drain away and the uterus get more and more closely contracted round the child, and the cord, if it should encircle the child, or if a loop of it lie unprotected by the limbs between a prominent part of the child's body and the uterine wall, may be so compressed that the circulation stops, and then oxygenated blood cannot get to the child, which dies from asphyxia. You can tell whether this danger is imminent, by auscultating the fœtal heart. The heart-beats get a little quicker as the uterine contraction begins, but then, as the pain reaches its height, get slower than before the pain began. There is a little quickening again as the pain passes off, and then the fœtal heart-beats return to their former frequency. If the child is in danger, the fœtal heart-beats first fail to regain their former frequency during the intervals of pain, then they become slower and intermittent, and at last stop. If you find, then, that the fœtal heart is slow between the pains, there is need of delivery.

There may be reasons of less weight for giving assistance, arising from the mother's condition. There is no danger of pressure damage, for the breech is too soft to produce the sloughing we find from the prolonged pressure of the head. And if feeble pains are the sole cause of delay, the breech is not pressed down strongly enough to damage anything. But there are disadvantages in letting a labour linger on, even though there be no immediate danger from pressure; for a very long labour exhausts the mother, from want of sleep, want of food, pain, and anxiety. Therefore, while we quite recognise that if we wait the patient will in time be naturally delivered, yet it will be good practice to hasten delivery, provided this be skilfully done. But no attempt should be made till the os uteri is fully dilated and retracted above the breech.

Digital pulling.—In this case (that of delay simply from weakness of pains) gentle, steady traction will accomplish delivery. Wait for a pain, then pass up your right forefinger over the anterior groin, between the abdomen and the thigh. Take the anterior first, because it is nearest. Assist the propulsive action of the uterus by pulling with the finger. As soon as the breech is low enough for you to reach the posterior groin, pass up the fore and middle fingers of the left hand over the groin. The posterior buttock has to make a longer journey, and encounter greater resistance, than the anterior, for it has to travel in a segment of a larger circle round the pubes, and to stretch the perineum, and therefore more pulling will be needed to get it down: and it is less easy to get a good grasp of the posterior buttock than the anterior. To counterbalance these difficulties, use two fingers to the posterior groin. You have now a good grasp of the breech. Do not pull at it between the pains; you will find delivery very difficult without the help of the uterus, so that you will only uselessly tire your fingers. If you could get out the child in the absence of uterine contraction, you would expose the patient to great danger of post-partum hæmorrhage. But when you feel the breech pressed down by the uterus, then pull as strongly as you can. As the breech passes the outlet, pull mainly on the posterior hip (Fig. 28), as this has to move round the symphysis. If the pelvis is of normal size, and the child of average dimensions, delivery by this method will be easy, and no damage can result from it beyond a little stiffness in the operator's fingers and fore-arms.

But pains may be vigorous, the breech well down in the pelvis, and yet labour does not progress. Assuming that the pelvis is normal, the cause is either a big child or else deformity such as hydrothorax or ascites. These latter conditions cannot be found out except by the impossibility of getting the enlarged body of the child through the pelvis.

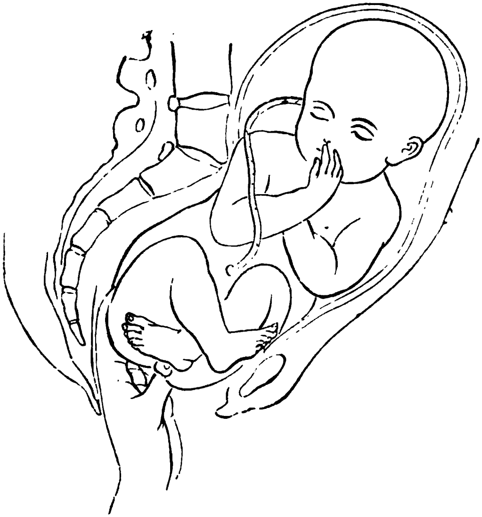

Fig. 23.—Digital Traction on posterior Hip. (*After R. Barnes.*)

Other modes of pulling.—If the child be not too big, it can be delivered by pulling. There are three ways of pulling strongly:—

1. *By bringing down a leg.*—It has already been urged that the diagnosis of a small pelvis or a big child ought to be made early, and if either be present a leg ought to be brought down at the

beginning of the second stage. But if the diagnosis is not made early, and the need for help is only discovered when the uterus is closely contracted round the child, it will be very difficult to bring down a leg; and if the obstruction be so great that the lower uterine segment is getting thinned, it will be dangerous to try. In such circumstances, therefore, do not try to get down a leg, but pull on the breech. You may do this by

2. *The fillet.*—This may be a silk handkerchief, which is soft and strong. Some accoucheurs carry a piece of strong webbing in the bag for this purpose; a piece of indiarubber tubing about two feet long with strong whipcord inside it has been suggested. The handkerchief, or the cord, or whatever is used, after being immersed for a minute in 1 in 1,000 sublimate solution, is passed with one finger or two fingers over the groin, and then seized with two fingers of the other hand; and thus a loop is formed by which the breech can be pulled onwards with as much force as the material of the loop will bear. It has been recommended that one end of the loop be passed from without inwards over each thigh, and the two ends brought down between the thighs, thus putting a girdle round the pelvis. This is an excellent way of getting a hold on the child; but it takes longer, and is more difficult to apply a loop over each thigh than only over one. Whatever the way in which it is applied, the loop has the advantage that the only harm done by it is the pressure it directly exerts on the child; and it is effective.

3. **The blunt hook.**—There is an easier way, viz. *the blunt hook.* It is easier to apply this than to pass a fillet over the groin. Take the hook in your right hand. Pass the first two fingers of the left hand up in front of the anterior groin. Pass the hook up between the child's body and your protecting fingers, the plane of its curve close to your fingers. When its point is above the fold of the groin, turn its point in between the thigh and the abdomen, and then

lower the hook, so that the groin may fill its concavity. Now pass two fingers of the left hand between the thighs of the child, and feel for the point of the hook. By movements of the right hand, guided by the information acquired by the left hand, adjust the point of the hook so that it shall not press either on the genitals or on the thigh, but be free between the thigh and the genital parts.

The blunt hook is the easiest way of pulling powerfully on the breech. It is the best means of delivery in really difficult cases. The objection to it is, that if it be used without due care, or if too small a hook be used, the end of the hook may injure the child; may lacerate the thigh, wound the femoral vessels, or damage the genitals. But with care these accidents can be avoided. If the child is known to be dead, the blunt hook can be used without fear; and in a case of breech delivery in which the difficulty is really great, and is due to disproportion between the child and the pelvis, it is so likely that the child is dead that the fear of possible injury need not be long influential in preventing you from taking up the blunt hook.

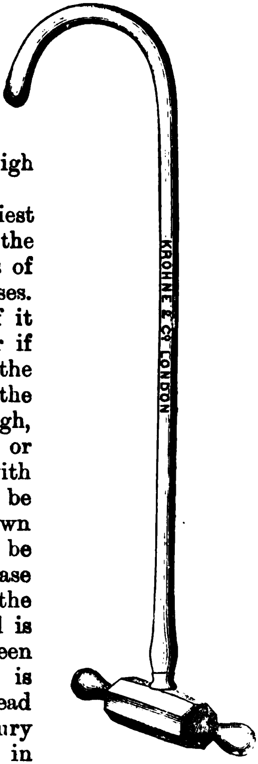

Fig. 29.—Blunt Hook.

Many blunt hooks sold in the shops are too small to be safely used with a big child, and it is for big children that you are likely to want the hook. The internal diameter of the curve of the hook ought to be at least two inches (Fig. 29). The handle should be transverse, and the whole instrument made of metal, so that it can be boiled when it is necessary to disinfect it.

Forceps for the breech.—It has been recommended to use the ordinary obstetric forceps to seize and pull down the breech. Special forceps have also been constructed with which to do this. The ordinary forceps is not suited for the purpose, and the special forms are less efficient in grasp, and more likely to do harm than the blunt hook. Therefore, have nothing to do with forceps for the breech.

Delivery of the arms.—When the trunk and legs have emerged, the next thing is the delivery of the arms. Now begins the danger for the child. If the arms and head are not quickly delivered, the child will die from asphyxia from pressure on the cord.

You are generally told to draw down a loop of the cord, but I do not know why; nothing is gained by doing so, except that you then know the cord is not too short. You are told also to put the cord where there is most room. If the pelvis is so shaped that you can at once perceive that the resistance is in one diameter, and there is plenty of room in another, and you can place the cord where there is room, do it; the advantage is evident; but such cases are rare. It is generally better to deliver at once, than to waste time in trying first to find out where pressure is least, and then to put the cord there.

Wrap the child's body in a napkin, and have it held forwards by an assistant, out of the way. Then pass the hand along the front of the child's chest, to feel for the arms. If they are in their proper place, you will feel them, and all you have to do is to hitch a finger first in one elbow, then in the other, and pull each down.

Bringing down the arms.—*If the arms are extended* by the sides of the head, their delivery is sometimes very difficult. Grasp the child's body so that you hold it by the bony ring of the pelvis (thus avoiding injury to the viscera from the pressure of your fingers), and draw it down, so as to get the arms as nearly within reach as possible. It is generally recommended to bring down first the arm which lies behind, on the ground that there is more room in the hollow of the sacrum. But it is not very important which you take first. Sometimes you will find the anterior arm easier to get, because it is nearer. Pass up the hand corresponding to the arm you are going to bring down, along the side of the child, nearer its dorsal than its abdominal aspect, and then along the arm, until your finger tips have reached the elbow (Fig. 30). Now place the fore and middle fingers

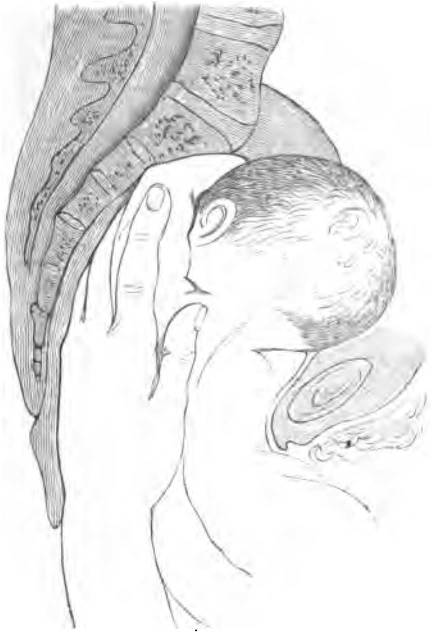

Fig. 30.—Bringing down the Arms. (*After Farabeuf.*)

along the child's humerus, that they may protect it like a splint, and with the tips of the fingers press the elbow down across the child's face. Continental accoucheurs recommend that while doing this, and especially in liberating the anterior arm, the child's body should be turned so that the arm should come down in the hollow of the sacrum. But this is not of importance, and is less easily done in the left lateral position adopted in Great Britain than in the dorsal position customary abroad. The bringing down of the arms is often very difficult, and should be done with the greatest gentleness and care.

There is a rare condition which causes great difficulty, viz. *dorsal displacement of the arm.* This means, that the arm is extended by the side of the head, and the elbow bent, so that the fore-arm lies behind the neck. As the head descends, the fore-arm is apt to catch on the brim, and unless the child be small, or the pelvis very large, to arrest the advance of the head.

There are two ways in which this displacement may occur. It is likely to be produced if you try to turn the trunk or head, instead of letting it be gradually turned by the resistance of the pelvic floor. Just as when you pull the body down too soon the arms are likely to remain up, so if you too hastily turn the body round the arms may not turn with it. Then, when the arm has thus got behind the head and the head is pushed or pulled down, the arm is carried down by the occiput behind the nape of the neck (Fig. 31).

This cause of delay will be discovered when you pass your hand up to bring down the arms. To undo the displacement, you must rotate the child in the opposite direction to the rotation which produced the displacement; press the vertex towards the opposite arm to the one which is behind the neck.

This is one way: the displacement taking place from above downwards; the arm being first extended, and then the fore-arm carried down. Extension of the arm carries the scapula away from the spine so that its outer edge forms the posterior wall of the axilla. Dorsal displacement of the arm has also been noticed as taking place in another way,

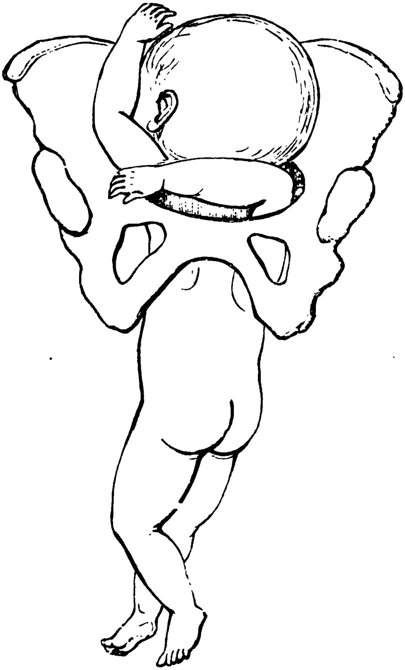

Fig. 31.—Dorsal Displacement of Arm. (*After R. Barnes.*)

viz. when the arms are not extended, but are lying across the chest. It happens from the same cause: from rotation of the trunk, which the arms have not shared. The body turning, the arm is (in relation to the child) forced back, and then, as the trunk of the child is pulled downwards, the fore-arm is carried (relatively) up. In this form, as the arm was never extended, the scapula is close to the spine, and its outer edge cannot be felt. The position of the scapula marks the difference between these two modes of production of the displacement. In this form the treatment is to pass up the hand along the back of the child, seize the elbow, and pull it downwards and forwards.

Delivery of the after-coming head.—The next business is *the delivery of the head.* This (except in unusual cases of pelvic deformity) must be done quickly, or else the child will die from asphyxia, owing to pressure on the cord.

With a normal pelvis, an average-sized head, and normal mechanism, the greatest diameter of the fœtal head that has to pass through the pelvis is half an inch less than the diameter of the pelvis through which it has to pass. There is, therefore, no obstruction to the delivery of the head, except from the soft parts. In such a case all that you have to do is to gently pull, in a direction at first downwards, then downwards and forwards. Pull forwards, that the nape of the neck may closely hug the symphysis, and thus the perineum be less stretched. You can pull best by putting the index and middle finger of the right hand on the shoulder of the child.

Suppose that from either small size of the pelvis or large size of the head, gentle pulling at the neck is unsuccessful; the head may be detained either (*a*) above the brim or (*b*) in the pelvic cavity. Pelvic contraction usually leads to detention above the brim (because the flat pelvis, in which the narrowing is at the brim, is the commonest kind of contracted pelvis). Large size of the head commonly leads to detention in the pelvic cavity.

Difficult delivery.—Consider first detention *above the brim.* There are three other ways in which the head may be helped through:—

1. By pushing from above.
2. By pulling on the jaw.
3. By forceps.

These have been variously combined, and different ways of applying the hands and fingers described. But all the different recommendations resolve themselves into these three modes.

Pressure from above.—The first mode is simple. Place both hands on the abdomen, over the uterus, and press down as hard as you can, taking care that the greatest pressure is exerted on the anterior part of the head, so that it may favour flexion. It is a simple matter, to place one's hands on a patient's uterus and push, so that you can get the nurse to do this while you assist by traction on the jaw or by forceps.

Simple pressure from above is not, in my opinion, the best way of delivering the after-coming head. If unskilfully applied, the occiput may be pressed down, and extension produced. But even if skilfully applied, it has the following disadvantage: pressure from above is exerted on the top of the head. It tends to make the vertex flatter instead of more pointed, and to enlarge the transverse diameters of the head, or at least to oppose their diminution. (See Fig. 86, page 205.) Hence, employed alone, it is not a method which gives a result in proportion to the force expended, and is not a good mode of aiding delivery, although applied to the front of the head it may assist flexion. The best use of pressure from above is to make it assist traction from below.

Jaw traction.—Delivery by pulling with the finger in the mouth was taught by Smellie,* and is called by his name (associated in French and German text-books respectively, with the name of the French or German obstetrician who introduced it in those countries). Unfortunately for his reputation, after recommending pulling with the finger in the mouth, he added, "If the operator is afraid of injuring or overstraining the lower jaw, let him push his fingers farther up, and press on each side of the nose." *This* is sometimes called Smellie's method. It is useless, for the force that can be exerted by it is limited by the friction

* "Midwifery," N.S.S. Edn., vol. i. p. 307.

between your greased finger tips and the slippery skin of the fœtus, and amounts to almost nothing.

The advantages of jaw traction are that (1) you not only get a hold of the head by which to pull on it; but (2) you ensure the proper mechanism, you prevent extension of the head; and (3) by combining it with pulling on the shoulders you halve the force required by either plan separately. Strong pulling on the shoulders alone may tear the cord or its meninges, or even fracture the spine; and if there be resistance it may extend the head. By pulling at the same time on the shoulders and the jaw, we can get the same amount of force to move the head onwards, with only half the danger of injury to the child; and extension is prevented.

In practice, you must often resort to jaw traction, for this simple reason, that it needs no instruments. If the after-coming head is detained, it must be delivered quickly. There is not time to send for instruments. If you have not forceps ready, you must deliver in some other way; and jaw traction combined with shoulder traction is the best way of non-instrumental delivery.

Mechanical effect of jaw traction.—The main utility of jaw traction is as a means of *traction.* In a preceding paragraph I have used the words "prevent extension," instead of "produce flexion." If with the finger you pull down the jaw, the head can scarcely get extended, and therefore by this mode of delivery you do prevent extension. But the power you have of producing flexion is very slight indeed, for the pull is exerted through the muscles and ligaments attaching the jaw to the base of the skull; and the attachment is only a little in front of the occipito-spinal joint. The force used acts at much less advantage in producing flexion than as a simple downward pull. And the production of flexion is quite unnecessary if only great extension is avoided, for if the chin descends into the pelvis, the pressure of the pelvic wall on the occiput will flex the head. Pulling on the chin, combined with pulling on the shoulders, is a better way of traction than pulling on either chin or shoulders alone (Fig. 32). It is better still to combine it with pressure from above, so limited to the front of the head as not to interfere with the moulding of the part of the head opposed to the conjugate.

It is often recommended to help flexion by pressing up the occiput with one or two fingers of the hand which is pulling on the shoulders. The reason given for considering the effect of jaw traction in producing flexion unimportant, applies to this recommendation also.

Forceps to the after-coming head.—This is the best way of delivering it when help is needed. I have delivered with forceps after others and I myself had failed to deliver by jaw traction and pressure from above. Pulling is better than pressure for this reason: when the after-coming head is delivered by pulling on the shoulders and jaw, the pressure of the contracted brim as the head comes down presses the parietal bones together, so that they meet in the sagittal suture at a slight angle. (See Fig. 85, page 205.) It thus makes the vertex less flat and more pointed, and lessens the transverse

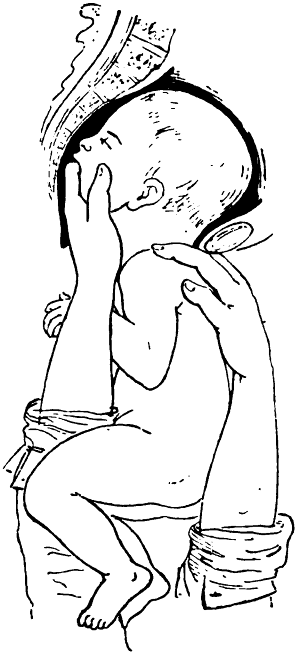

Fig. 32.—Delivery of Head by combined Jaw and Shoulder Traction. (*After Chailly Honoré.*)

measurement of the skull. The forceps acts in the same way, for its grip is applied to the part of the head which is in contact with the side walls of the pelvis; it does not press on the top of the head, and therefore does not prevent moulding. Therefore in a breech case in which you apprehend difficulty with the after-coming head, have the forceps ready on the bed. Feel the pulsations of the cord. If traction does not deliver, and the pulsations are getting slower or irregular, apply the forceps without any delay. It is not more difficult to apply forceps to the after-coming than to the fore-coming head. If forceps traction fails, the pulsation of the cord will soon stop. After the cord has ceased to beat, do not inflict on the mother any further risk of damage to her soft parts, but cease pulling, remove the forceps, and take up the perforator.

As a rule, if the head is not extracted within five minutes after the liberation of the arms, the child will die.

It has been recommended, by the introduction of *two* fingers into the mouth, to keep open, between the two fingers, an air channel, through which the child may breathe, pending the success of efforts at delivery, and thus death from asphyxia be prevented. In my opinion this is unnecessary, because a child that can be delivered alive at all, can be delivered quickly with the forceps. I agree with Spiegelberg, who says that the preservation of life by this manœuvre will be more due to good luck than to anything else.

Arrest in the pelvic cavity.—The head may have passed the brim, and come down into the pelvic cavity, and pulling may be required to deliver it. If the natural mechanism has not been interfered with, the occiput will be in front, the face in the hollow of the sacrum, the chin pressing on the perineum. When the head is in this position, the proper mode of delivery is by what is called the "Prague method" (Fig. 33). Wrap the limbs of the child in a napkin. Grasp the legs with your right hand. Put the palm of your left hand on the front of the child's trunk, and the index and middle finger one over each shoulder. Carry the legs with your right hand as far up over the mother's abdomen as you can, and then by the combined pulling of the two hands pull the neck and shoulders forwards. Thus you have a "couple" of forces; you pull forwards the front of the head, while the resistance of the symphysis pubis presses back the occiput. Thus the head is flexed, and put in the best position for passing the outlet. Put in another way: the head is converted into a lever of the third order, the power being the pull applied through the neck; the fulcrum the symphysis pubis; the weight the resistance of the soft parts.

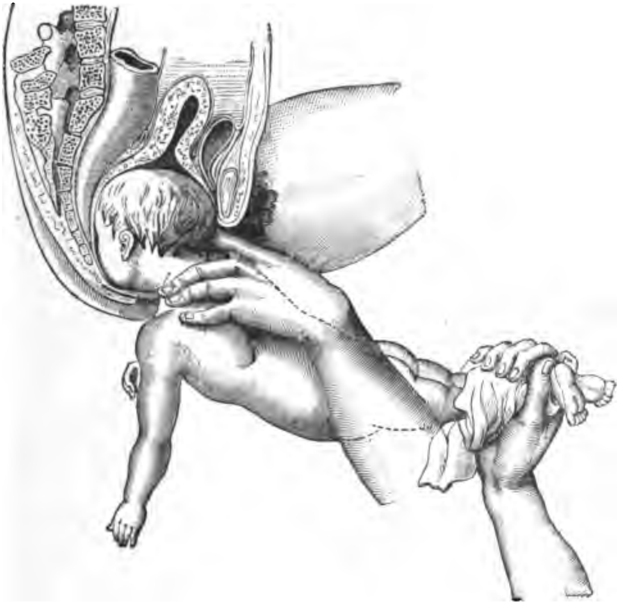

Fig. 83.—The so-called "Prague" Method of Delivering the after-coming Head.

This mode of pulling is only suitable when the head has quite descended into the pelvic cavity, and is therefore ready to make its movement of rotation round the symphysis pubis. You may grasp it in this manner if you like, before it has descended so low; but if so, you must pull downwards, but not forwards until the face is in the hollow of the sacrum.

If pulling by the Prague method is not enough to deliver the head, forceps may be applied when it is in the cavity as well as when it is above the brim.

Arrest of head by the imperfectly dilated cervix uteri.—The advance of the head may be hindered by the cervix, which although dilated enough to let the trunk pass, is not large enough to let the greatest diameter of the head pass. If the delivery of the body has been so hurried, by pulling too soon, that the arms have been kept up, we have the head and arms imprisoned by a cervix just big enough to let the body slip through. The strong probability is that either it will be such a long and difficult task to get down the arms that the child will be stillborn, or that in forcing up the hand to bring down the arms quickly, the cervix will be extensively torn. The arms must be liberated as gently as possible; and the stretching of the cervix, which cannot be avoided in bringing down the arms, will probably make the canal big enough to let the head pass.

If the arms are down by the side of the chest, and the head is retained by the os uteri not being large enough to let its greatest diameter pass, apply the forceps.

Delivery with face anterior.—In the third or fourth breech position the occiput ought to turn forwards. This does not always happen. In some rare cases, from causes which have not yet been ascertained, the face remains in front. In that case delivery may take place in one of two ways: (*a*) The head may remain flexed, and thus pass; chin, mouth, nose, forehead, successively passing down behind the pubes (Fig. 34). This is an unfavourable mode of delivery, because the curve of the pelvic canal causes the neck to be so carried forward that, however much the head be flexed, the sub-occipito-frontal diameter cannot be brought into the brim. The diameter that has to pass the brim is the occipito-frontal, which averages four inches and a half, instead of the four inches of the sub-occipito-frontal. (*b*) The chin may meet with resistance from the symphysis pubis, and thus the head get extended. The chin rests above the symphysis, the front of the neck hugs the back of the symphysis, the head then rotates round the symphysis, the occiput being first born (Fig. 35). In this mode of delivery the cervico-vertical measurement, which is four inches and a half, is opposed to the pelvic antero-posterior diameter.

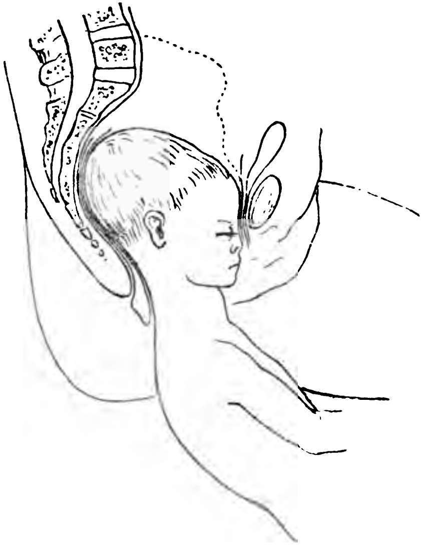

Fig. 34.—Delivery of after-coming Head with Face anterior: head flexed.

These deviations from the normal mechanism are usually, and probably always, produced by untimely pulling. They are excessively rare, if they occur at all, in cases in which delivery is left to nature, or interference strictly limited to assisting nature.

Madame La Chapelle (whose vast experience makes her advice weighty) recommended that if the face be in front, the hand should be passed up in the hollow of the sacrum, behind the head, and then moved round the side of the head to reach the mouth. In doing this the head will be turned so that the face looks to the side of the pelvis, which is the way in which it can best pass the brim. If this manœuvre fail, forceps should be used. If forceps fail, perforation is the only resource.

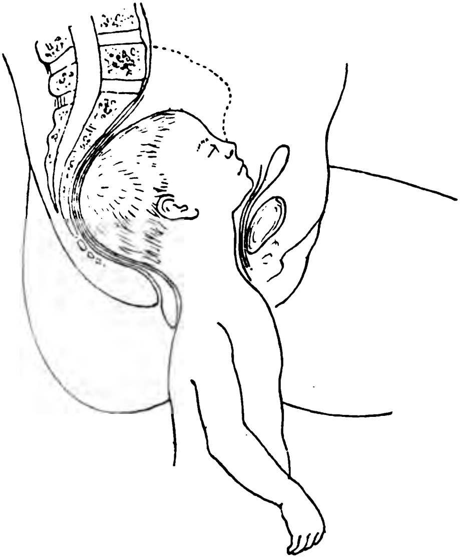

Fig. 35.—Delivery of after-coming Head with Face anterior: head extended.

Injuries to the child in breech deliveries.—The pulling on the child, which is necessary in difficult breech deliveries, often does damage.

Pulling on the breech with fingers, fillet, or hook may injure. Even with the fingers ecchymosis may result. The fillet may bruise or even cut the soft parts: hence the desirability of using something thick and soft. The blunt hook may with its point injure the genitals or the femoral vessels, if so applied that its point presses on these parts. It may dislocate the femur, or separate the shaft from the upper epiphysis, although both these injuries are rare.

Bringing down a foot and pulling on it may separate the lower epiphysis of the femur from the shaft. Therefore, in pulling on the limb brought down, hold it as high as possible. In case of injury to the thigh it is difficult, if not impossible, in consequence of the movements of the child and the necessity for keeping it clean, to keep the injured bone at rest by any of the methods used for older subjects. Credé recommended fastening the thigh up to the abdomen by means of a soft napkin passed round the popliteal space.

In *bringing down the arms*, fracture of the humerus is likely to happen if the humerus is pulled on near the shoulder, instead of being pushed down by the fingers applied at the elbow. In rotation of the child to liberate the arm displaced behind the neck, separation of the upper epiphysis may happen. The treatment of these injuries is to bind the arm to the side of the chest with splints if there be deformity. Fracture of the clavicle may happen if the hand is forced up violently between the side of the child and the pelvis. It may also happen in pulling down the body of the child with the fingers on the shoulders to bring the arms within reach. This is one of the commonest injuries sustained in breech deliveries. In order to avoid it, be gentle in manipulation.

By *pulling on the trunk* of the child, the liver or the suprarenal capsules may be crushed. To avoid this, seize the child by the pelvis, the bones of which will protect the soft parts they enclose from injury. If this is done a tight grasp will only cause some bruises over the hips. There may be hæmorrhages into the muscles of the spine. When great force has been used the spinal cord has been torn across, and the vertebral column has been injured. Such injury may be associated with great hæmorrhage into the cellular tissue behind the peritoneum and pleura. When the spine is injured, the body of a vertebra is generally torn from the epiphysis (which remains attached to the intervertebral cartilage), and the anterior vertebral ligament torn through.

The most serious injuries are those which may be inflicted in *pulling the head through.* These are sometimes almost inevitable, for the head must be delivered quickly, and to deliver quickly in a difficult case, you must pull hard. The fingers applied over the clavicles may fracture them, or may so injure the brachial plexus as to cause paralysis, lasting for days or weeks after birth. This paralysis, fortunately, always gets well. The cervical spine may be torn through, and the spinal cord. This is especially likely to happen in the Prague method of delivering the head, because in this the whole force is exerted through the neck. The neck is seldom torn quite through, because the soft parts hold together longer than the spinal column, but it is possible, especially in premature and dead children, to detach by pulling the body from the head. Hæmorrhages into the muscles and cellular tissue of the neck may occur.

One result of this hæmorrhage is well known, viz. *hæmatoma of the sterno-mastoid* muscle. This forms a tumour usually on one side only, and usually situated on the anterior half of the muscle. It forms a swelling as big as a pigeon's egg or larger. It generally disappears within six months after birth. It may last longer, and sometimes causes permanent wry-neck. It is much commoner on the right side than on the left, because in the most frequent breech positions the head comes down with the face looking to the right side, and therefore the right sterno-mastoid is the more pulled upon.

In helping delivery by *the finger in the mouth,* the mucous membrane may be torn, the two halves of the jaw may be separated at the symphysis, the jaw may be dislocated, or the condylar epiphysis may be detached. On the average, a force of above fifty pounds is required to damage the jaw.*

Lastly, the skull and brain may be injured. The basilar portion of the occipital bone may be separated from the squamous. The parietal bones may be fractured. Meningeal hæmorrhage may take place.

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* Duncan, Obs. Trans., 1878.

CHAPTER VI.

TRANSVERSE PRESENTATIONS.

TRANSVERSE presentations include all cases in which any part other than the head or breech presents.

The causes of transverse presentations. Premature or decomposing children.—The great cause of the frequency of head presentations is the continually acting force of gravity. It is found by experiment that a child at full term, so recently dead that decomposition has not commenced, floats in fluid of about its own specific gravity in exactly the position which it occupies in utero. In premature children the centre of gravity is not the same as in full-term children, and its position is also altered by decomposition. Hence, with premature and dead children, gravity does not help to make the head present. Transverse presentations occur about once in 200 labours at full term, but once in about eight labours with *premature* or *decomposing* children.

The action of the uterus, in driving the head into the brim, requires for its effect some degree of stiffness of the fœtal trunk, or else the pressure of the uterus on the breech is not transmitted to the head. In decomposing children, this stiffness is lost. This *abnormal flexibility of the child* helps other causes that have been named, to bring about transverse presentations of decomposing children.

Non-engagement of head in pelvis.—Gravity makes the head sink towards the brim. If the pelvis is large enough, the head becomes engaged in the brim, and is held there by the contraction of the uterus round it. In the later months of pregnancy the child grows so much faster than the liquor amnii increases, that after the seventh month it can no longer be said to float in the liquor amnii, for it can move very little indeed without coming into contact with the uterus, and the uterus, therefore, holds it in the brim. The more nearly the axis of the uterus is continuous with that of the pelvic brim, the more effective will its contraction be, in driving the head into the pelvic brim, and keeping it there. Conditions which interfere with this natural order of things will favour transverse presentations.

Defective uterine action.—The uterus, by keeping the head pressed into the pelvis, has much to do with securing a normal presentation. If it does not do this, transverse presentations are apt to occur. The best example of the effect of *weakness of the uterus* in allowing malpresentations, is in the case of the second child of twins; half of which present transversely. If the uterus is sunk forward, as in pendulous belly, or deviated laterally, it will not act so well in keeping the head pressed into the brim. Hence, transverse presentations are commoner in multiparæ than in primiparæ, because in the former the abdominal walls (from previous stretching) are looser and do not support the uterus so well as in the latter. *Pendulous belly* and *lateral obliquity of the uterus* frequently go with contracted pelvis, so that here we have another instance of the coincidence of more than one cause leading to transverse presentations.

Obliquity of the uterus.—If the uterus is oblique the long axis of the child is oblique, too. This obliquity tends to move the head towards the iliac fossa of the side opposite to that to which the fundus uteri leans. In a well-shaped pelvis the obliquity must be extreme to bring the head into the iliac fossa. But in a contracted pelvis, a slight degree of uterine obliquity may determine whether the head lies over the brim or in an iliac fossa (Fig. 36). If the head be so far displaced to the side that the ilium hinders its descent, the effect of the forces of labour will usually be to drive down the shoulders, and drive the head farther towards the side.

This effect of uterine obliquity is shown to be a reality by the fact that presentations of the right shoulder (the back being anterior) are more common than presentations of the left. As right uterine obliquity is commoner than left, this is exactly what we should expect. The back is usually anterior in shoulder presentations, for the same reason that it is in head presentations.

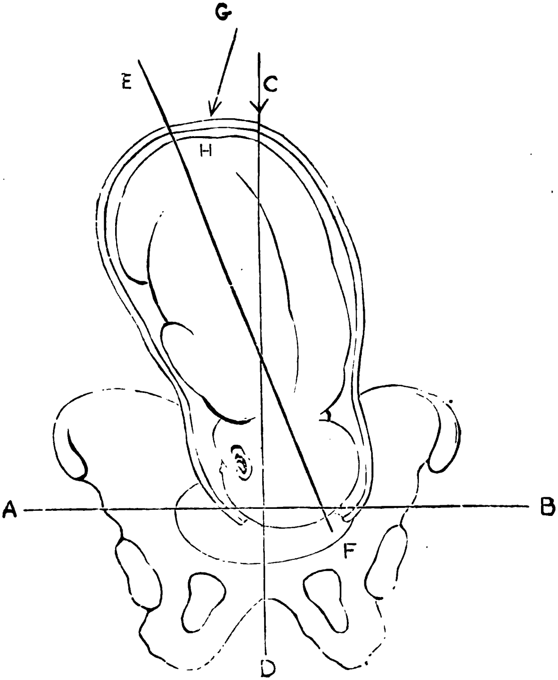

Fig. 30.—Showing the earliest Stage in the Production of transverse Presentations by uterine Obliquity: that which is probably often spontaneously rectified. (*After R. Barnes.*)

A B, Plane of brim; C D, normal axis of uterus; E F, axis of child and uterus; G H, line of action of abdominal muscles and diaphragm.

Hydramnios.— If there is *excess of liquor amnii*, so that the child floats about freely in the womb up to the end of pregnancy, instead of being pressed into the brim and held there by the action of the uterus, then it is possible that at the moment when the membranes rupture, the head may not be exactly over the brim, and the child will fall across the brim in a transverse or oblique position. In dropsy of the amnion labour often comes on prematurely, so that in these cases we often have two causes acting together to prevent a natural presentation. Therefore, cross-births are common with hydramnios.

Contracted pelvis.—If the pelvic brim is contracted, the head may not be able to enter it. Then it may get in one iliac fossa, and the shoulder will present. Transverse presentations have been found to occur twice as often in labours with contracted pelvis, as in those with normal pelvis.

Tumours, either of the pelvic bones or of the soft parts, which at all obstruct the entry of the head into the brim, will act just like contracted pelvis in causing transverse presentations.

Placenta prævia renders the entrance of the head rather less easy, and in this complication labour is often premature, so that here again we have a combination of causes.

Modes of natural delivery.—Before considering the treatment of shoulder presentations, let us see how nature can deal with this difficulty. There are four ways in which delivery may take place naturally in transverse presentations.

Spontaneous rectification.—The first is *spontaneous rectification.* The fœtus rarely lies transversely. It usually lies obliquely, with the head in one iliac fossa, and the shoulder lying over the pelvic brim. The head bulges out the uterine wall at the side to which it is directed. As the uterus contracts, it tends to assume its own proper shape; and this tendency is resisted by the head bulging in the iliac fossa. If the child is freely movable, the pressure of the uterus against the head may press the head towards the brim so effectively that the head becomes engaged in the brim, and becomes the presenting part. It is known that the position of the child is frequently changed during pregnancy, and from that fact it may be inferred that oblique positions are often rectified during pregnancy. Rectification may take place during the first, or at the beginning of the second stage of labour. It is necessary for its occurrence that (*a*) the child should be movable, and also (*b*) that there should not be too much liquor amnii: for (*a*) if the presenting part is so driven down into the brim that it cannot move laterally, then spontaneous rectification is impossible; and (*b*) if there is a great deal of amniotic fluid, the pressure of the fluid, pressing equally in all directions, tends, during uterine contractions, to make the uterine cavity as nearly spherical as its structure and surroundings will allow; and also protects the child from the pressure of the uterine wall.

We do not know why it is that in one case uterine action drives down the shoulder, and in another presses the head into the brim. In a case of oblique presentation early in labour you therefore have no means of knowing whether spontaneous rectification is likely to happen or not, but the probability is against it. Therefore, do not wait for its occurrence, but imitate nature, and rectify the position by pressure with the hands on the abdomen.

Spontaneous version (*Denman*).—The second mode by which delivery is sometimes naturally ended in transverse presentations is called *spontaneous version*. It was first described by Denman, under the title of "spontaneous evolution;" but this name is now given to a different process, which was first described by Douglas. As these two processes have been in some text-books confused together, I keep as closely as is convenient to the language of the original descriptions.

Denman's* description of *spontaneous version* ("evolution" as he called it) is the following: "The body is brought into such a compacted state as to receive the full force of every returning pain. The body in its doubled state, being too large to pass through the pelvis, and the uterus pressing upon its inferior extremities, which are the only parts capable of being moved, they are forced gradually lower, making room as they are pressed down for the reception of some other part into the cavity of the uterus which they have evacuated, till the body, turning as it were upon its own axis, the breech of the child is expelled,

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* "Introduction to the Practice of Midwifery," 7th edn., p. 355.

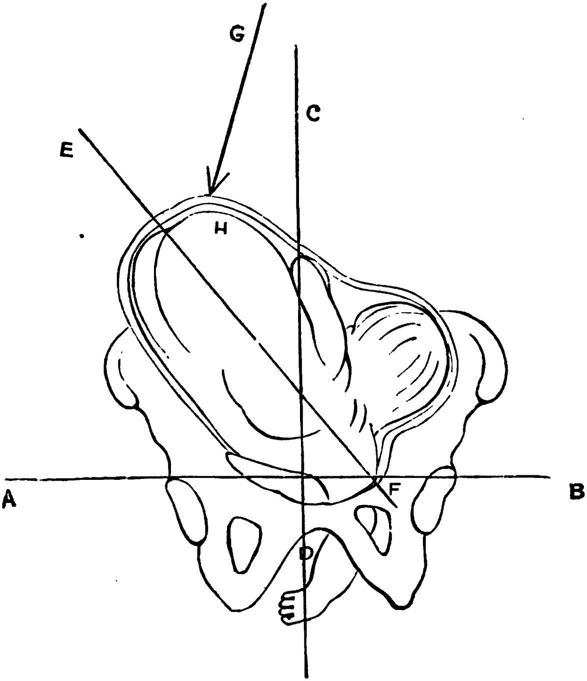

Fig. 37.—Showing what takes Place in spontaneous Version: descent of breech, ascent of shoulder. (*After R. Barnes.*)

AB, Plane of brim; CD, normal axis of child and uterus; EF, axis of child lying obliquely; GH, direction of pressure exerted by diaphragm and abdominal muscles.

as in an original presentation of that part (Fig. 37). Nor has there been anything uncommon in the size or form of the pelvis of these women to whom this case has happened, nor have the children been small or suffered by putrefaction. I believe, on the contrary, that a child of the common size, living, or but lately dead, in such a state as to possess such a state of resilition, is the best calculated for expulsion in this manner. Premature or very small children have often been expelled in a doubled state, whatever might be the original presentation, when the pelvis was well formed, or rather more capacious than ordinary: but this is a different case to that we are now describing."

Spontaneous version as a rule takes place later in labour than spontaneous rectification. It always takes place in the *uterus:* never in the *pelvis.* It is supposed to be due to irregular uterine contraction, so that while one part of the uterus is contracting and pressing down the breech, the part over the head is relaxed so that the head can move up. But this is only theory. No observations showing how spontaneous version is effected have been made. We know nothing as to the conditions on which it depends; we cannot predict its occurrence. Therefore act as if there were no such thing as spontaneous version.

Spontaneous evolution (*Douglas*).—This was first described by Dr. John C. Douglas, of Dublin. In the following description I keep very close to Dr. Douglas's words. In the second stage of labour the shoulder is forced very low into the pelvis. The shoulder and thorax are at each successive pain forced still lower, until the ribs press on the perineum, and cause it to assume the same form as it would by the pressure of the forehead in a natural labour. At this period not only the entire arm, but the shoulder, can be perceived externally, with the collar-bone lying under the arch of the pubes (Fig. 38). By further uterine contractions the ribs are forced more forward, appearing at the orifice of the vulva, as the vertex would in a natural labour, the clavicle having been by degrees forced round on the anterior part of the pubes. The entire fœtus, immediately prior to its expulsion, somewhat resembles the larger segment of a circle; the head rests on the pubes internally, the collar-bone presses against the pubes externally. The arm and shoulder are entirely protruded, with one side of the thorax not only appearing at the vulval orifice, but partly beyond it; the lower part of the same side of the trunk presses on the perineum, with the breech either in the hollow of the sacrum, or at the brim of the pelvis, ready to descend into it. By a few further uterine efforts, the remainder of the trunk, with the lower extremities, is expelled (Fig. 39). Delivery is finished as in a labour in which the breech had presented (Fig. 40).

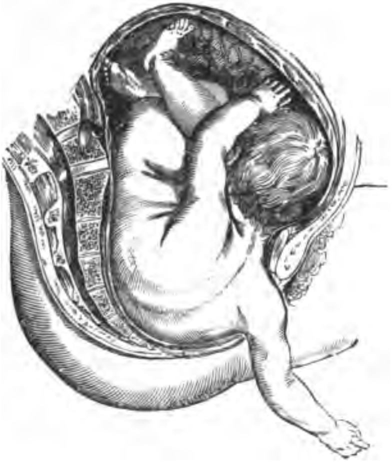

Fig. 38.—**Spontaneous Evolution in Progress: arm** outside vulva, side of neck behind pubes, side of chest pressing on perineum.

This mode of delivery takes place when the fœtus has descended into the pelvic cavity. It requires very powerful uterine action to accomplish it. If only the uterus is strong enough, a full-time child may be delivered through a pelvis of average size in this way, and may survive. Delivery in this way, if it is going to take place at all, will do so quickly. In the cases recorded by Dr. Douglas, the labour was in each case over in less than six hours. But it is very seldom that the uterus is strong enough to drive out the child in this way, and therefore you must not expect or wait for this to happen.

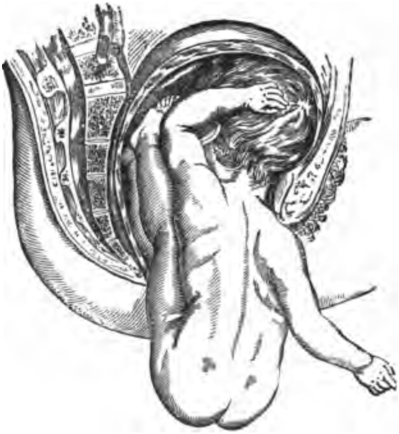

Fig. 39.—Further Stage of spontaneous Evolution : side of neck still fixed behind pubes, chest and pelvis delivered, legs about to follow.

Spontaneous expulsion.—The fourth way is called "*spontaneous expulsion*" or "*partus corpore conduplicato.*" In it the child is driven through the pelvis doubled up, so that its chest and belly come out first, and then its head and legs (Fig. 41). This only happens with dead children, whose bodies are by decomposition rendered softer than natural, so that they can double up more easily. Dead children are often premature. A premature, dead, and decomposed child can easily be delivered in this way.

The frequency of delivery in shoulder presentations of a full-time child, by one of these natural ways, has been variously estimated at from 1 in 10 to 1 in 40. The frequency with which it is observed must obviously vary according to the length of time during which the labour is allowed to go on before the unfavourable position is corrected. Taking the most liberal estimate, it will be clear that great risk will be run by waiting for spontaneous version or evolution.

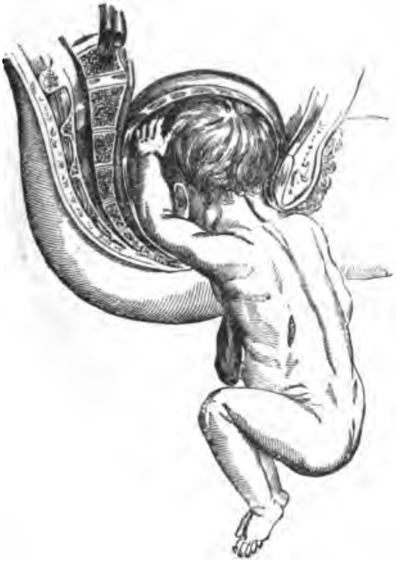

Fig. 40.—Termination of spontaneous Expulsion: delivery of trunk and lower extremities complete, head and posterior arm about to follow.

Results if not corrected.—If a transverse presentation is not rectified, and the membranes burst, the liquor amnii flows away more quickly and completely than in head presentations, for the shoulder does not come down into and plug the os as the head does. When the liquor amnii has run off, the uterus closely embraces the child, and becomes as it were moulded to the shape of the child. At first, the uterine wall is everywhere of nearly the same thickness; there is thinning of the cervix, proportionate to the degree of dilatation of the os, but no thinning of the lower segment of the uterus; and the uterus, although clinging close to the child, yet alternately contracts and relaxes, and while it is relaxed, the child can be moved within it. While this is the case the hand can be introduced, if the os uteri is large enough, and the child turned, without danger. The length of time

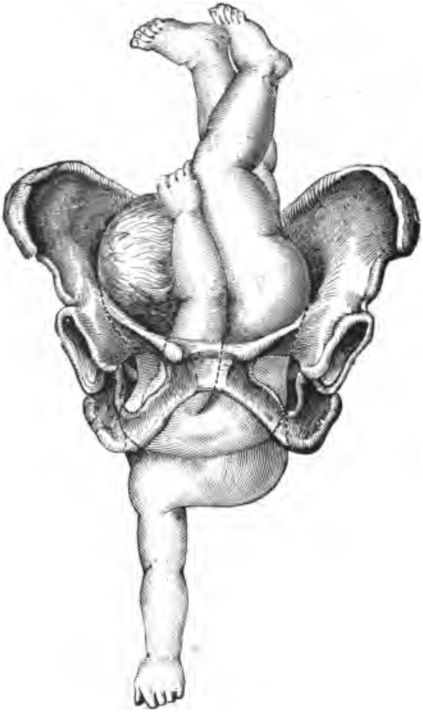

Fig. 41.—Spontaneous Expulsion: child doubled up, legs and head expelled together.

that this condition lasts depends upon the frequency and strength of the pains. It generally persists until the os uteri is fully dilated, and for a little while afterwards.

Tonic contraction and rupture of uterus.—If, after full dilatation of the os, the position of the child is not corrected, and it cannot be driven out by spontaneous evolution or expulsion, further changes take place. The upper or active part of the uterus goes on contracting with increased violence and frequency. It pulls up and stretches the passive part of the uterus—*i.e.* the lower segment of the body and the cervix; and by pulling up the cervix it stretches the vagina. The greater part of the child is expelled from the uterine cavity into that formed by the stretched cervix and vagina. The case terminates, if neither spontaneous evolution nor expulsion occurs, nor help is given, in one of two ways. The pains succeed one another so fast that there comes to be no interval between them; the uterus passes into a state of *tonic contraction*, and this condition may last until the mother dies of exhaustion. The other termination, and the rarer one, is rupture of the thinned and stretched part of the genital canal. In shoulder presentations the cervix is not nipped between the presenting part and the pelvic brim (as it often is when the head presents and the pelvis is contracted), and therefore generally the cervix is drawn up, and the vagina is the part that gives way. How rare this is may be judged of by the fact that while transverse presentations occur about once in 200 labours, rupture of the uterus or vagina only occurs about once in 3,000 labours, so that if all ruptures were due to transverse presentation this would only give about 1 in 15 as so ending. But only about 1 ruptured uterus or vagina in 4 is due to transverse presentation, so that this gives about 1 in 60 as the proportion of transverse presentations in which the genital canal is ruptured. But this small proportion would no doubt be larger were it not that in most cases the danger is averted by timely treatment. Although treatment in the vast majority of cases saves the patient from rupture of the uterus or vagina, yet there are a few cases in which such rupture is produced by injudicious attempts at turning. If the hand is forced into a uterus the lower segment of which is stretched and thinned to the utmost, there will be great danger that the uterus will be ruptured. In transverse presentation most cases of rupture of the *uterus* arise in this way, the ruptures that take place without interference being usually of the *vagina.*

Treatment.—The successful treatment of transverse presentations depends very largely upon early diagnosis. The position ought to be recognised in the beginning of labour, by external palpation.

Consider now the treatment in the different circumstances in which you may be called upon to manage a case of transverse presentation.

First: *The membranes unruptured,* and the *os not larger than a crown piece.* Rectify the position of the child by external manipulation. In other words, perform external cephalic version. No harm can be done by trying to do this. The only ill result that can happen is that the attempt may fail. This treatment should be preferred, because it is very desirable that the os should be dilated by the bag of membranes. The risk of rupturing the membranes that must always go with manipulation of the child through them, is a reason for postponing version. Further, until the os is as big as a crown piece, bipolar version and the bringing down of a leg cannot easily be done. An os uteri the size of half-a-crown will just admit two fingers: it must be as big as a crown to admit two of the operator's fingers and the child's foot. For these reasons do not interfere at this stage of the labour, except to rectify the position of the child by external manipulation.

Second: *The os is larger than a crown piece, but not fully dilated; and the membranes unruptured.* The welfare of the mother and that of the child are here somewhat opposed. Freedom from subsequent complications and quick delivery, which means preservation of the mother's strength, are best secured by performing bipolar version and bringing down a foot as soon as the os is the size of a crown piece. But if this is done, as the body of the child has to dilate the os uteri, it is very likely (from causes explained in the chapter on breech presentations) that the child will be stillborn.

If on the other hand we wait, the dilatation of the os, if the membranes remain entire, will go on in a natural manner, and when the os is fully dilated, the child can be turned and quickly delivered; and if the labour runs this course, the danger to the child (if everything but the presentation is normal) is little, if at all, more than in a normal labour.

But the labour does not always go on thus. Often, indeed usually, the membranes rupture before full dilatation of the os, because the presenting part does not fill the os uteri, and therefore does not dam off the bulk of the liquor amnii from the portion of the bag of membranes which is dilating the os. This portion is therefore exposed to the full intra-uterine pressure, it bulges down like the finger of a glove, and often gives way early. The liquor amnii gradually drains away, and the uterus more and more closely hugs the body of the child. The more closely it adapts itself to the child, the more difficult and dangerous turning becomes. By postponing version we give the child the chance that the membranes may persist till full dilatation and the child then be delivered living; but we also expose the mother to the risk that the favourable time for turning may be lost, and the operation be postponed until it becomes dangerous.

If you are able to remain in close attendance upon the patient, so that you may at once know when the membranes rupture, and then turn or artificially dilate without delay, the best practice is to leave the bag of membranes to dilate the os as long as possible. If, on the other hand, as may happen in country practice, the needs of other patients make it impossible for you to remain for hours near the bedside of one, the best practice will be to bring down a leg as soon as the os is the size of a crown piece.

Third: *The os uteri is fully dilated, and the bag of membranes entire.* This is not often the case, but may happen. Perform internal podalic version and deliver.

Fourth: *The membranes are ruptured. The os uteri is not large enough for delivery.* Dilate the cervix with Champetier de Ribes' dilating bag, and when it is fully dilated, deliver by internal version.

Fifth: *The os is fully dilated and the membranes ruptured.* The uterus is moulded to the shape of the child, but regular pains are present, and between the pains the uterus softens and the child is movable. Listen to the fœtal heart, and if the child is alive bring down a foot by internal version and deliver.

Sixth: *The uterus is in a state of tonic contraction.* The patient is in persistent pain; her pulse is quicker than it should be; the uterus felt through the abdomen is continuously hard and does not relax: the child is driven down into the pelvis and you cannot push it up without great force. Listen for the fœtal heart. If you cannot hear it, and cannot perceive fœtal movements, the child is probably dead. If the room is so noisy that you distrust your auscultation, pass up two fingers along the abdomen of the child and try and reach the cord, to feel if it is pulsating. If by some or all of these evidences you think the child is dead, or if tonic contraction of the uterus be undoubtedly present, pull down the arm and decapitate.

The operations of version and decapitation are described in the chapters on those subjects.

CHAPTER VII.

ON PROLAPSE OF EXTREMITIES.

Displacements of arm.—The fore-arms should be crossed in front of the chest. Sometimes an arm, from causes which we do not understand, gets displaced from this position. It may lie between the head and neck on the opposite side, or on the same side, or be extended by the side of the head, or it may get behind the neck.

Effect of slight displacement.—When an arm lies between the shoulder and the head, either on the same or on the opposite side, it offers a slight hindrance to the descent of that shoulder, and may make the mode of delivery of the shoulders different from that which is usual. The shoulder, the contour of which is not altered by the presence of an arm in contact with it, comes down more readily, and rotates to the front. If the descent of the anterior shoulder is hindered, then the body of the child will make a hyper-rotation, the posterior shoulder coming to the front. The mechanical effect is interesting, but this slight degree of prolapse of the arm can hardly be called a difficulty, as no treatment is required.

Descent of hand with head.—The arm may be extended, so that it lies by the side of the head, and enters the pelvic brim with the head. If the head and pelvis are of average size, this offers no insuperable difficulty to delivery. But very often it goes with contracted pelvis, for the head not fitting the brim leaves room for the hand to come down; and when the arm has come down, its presence in the brim makes the entry of the head more difficult than it was before. Therefore, if you find an arm down by the side of the head, remember that it may indicate pelvic contraction. Prolapse of the arm may also result from an oblique position of the child so that the head is slightly deviated towards one side of the brim, leaving room for the arm to come down in the opposite side of the brim. Uterine obliquity is more likely to produce this effect in a contracted than in a normal pelvis. In a normal pelvis, the presence of the arm opposite a sacro-iliac synchondrosis will make the head lie more transversely than usual.

Treatment.—(1) *Postural.* If the prolapse of the arm is found out early in labour, before the membranes are ruptured, and appears due to an oblique position of the fœtus, the proper treatment is to press the head into the brim, and direct the patient to lie on the side *away* from which the body of the uterus leans, so that gravity may correct the uterine obliquity. One cause hindering the engagement of the head will thus be removed.

(2) *Replacement.* If this be not successful, or if the membranes have been ruptured, but the head has not descended into the pelvic cavity, introduce your left hand into the vagina, and with two fingers press the prolapsed hand up and towards the front of the head, past the greatest diameter of the head. If the pelvis is natural, the child's head of average size, and the uterus acting regularly, the pains will soon press the head so down into the pelvis that there will be no room for the hand to come down again.

(3) *Turning.* But if, after pushing up the hand, the head does not come down, and there is still room between the head and the pelvis, so that the hand comes down again, the probability is that the pelvis is contracted, or the dimensions of the head are abnormal. In such a case the best plan will be to turn by the feet as soon as the os uteri is fully dilated.

(4) *Forceps.* If the prolapse of the arm be not discovered until the head has descended into the pelvic cavity, with the arm beside it, the fact of its descent shows that the pelvis is little, if at all, contracted. At this stage of the labour you cannot replace the arm. If the pains are strong, let it alone, and the head and

arm will probably come through together, or the head may spontaneously be pushed past the arm. If there be delay in the delivery of the head, help it into the world with forceps, taking care that the forceps' grasp does not include the arm as well as the head.

Dorsal displacement.—The arm may be displaced behind the neck, a condition to which Sir J. Simpson gave the name of "*dorsal displacement of the arm.*" The arm thus displaced hinders the descent of the body, for either the child's body and the displaced arm must come through the pelvis together, or the arm must be forced in a direction contrary to that of its natural movement.

Diagnosis.—This condition is very difficult to detect. It can only be found out by observing that descent is hindered without any cause appreciable by the ordinary methods of examination. This should lead to an examination with the whole hand in the vagina, and the other hand applied outside. Thus a complete bimanual investigation of the state of the parts above the brim of the pelvis can be made and the position of the arm found out.

Treatment.—There are three methods of treatment. One is to *bring down the arm* by the side of, and towards the anterior part of the head. Then the case becomes an ordinary one of head and arm. The second plan is to grasp the head and *rotate* it in the direction towards which the fingers of the displaced arm point, in the hope that the movement of the arm with the head may be prevented by friction, and thus it may be restored to its proper position by the side of the child. The third method is to perform *podalic version.* These cases are so rare that no accoucheur has himself seen enough cases, and not enough have been reported, to enable a conclusion to be drawn as to the relative merits of the two first methods. Sir J. Simpson, by whom the first was recommended, in a case in which he carried it out, had afterwards to turn. In my opinion, turning is the safest and best method of dealing with this difficulty. The hand must be introduced into the uterus for the sake of diagnosis, and when this has been done, the knee will not be far off.

Prolapse of the feet or a foot is practically merely a variety of footling presentation, whether the foot be by the side of the head or with a hand or shoulder (Fig. 42). The best treatment is to bring down one foot at once.

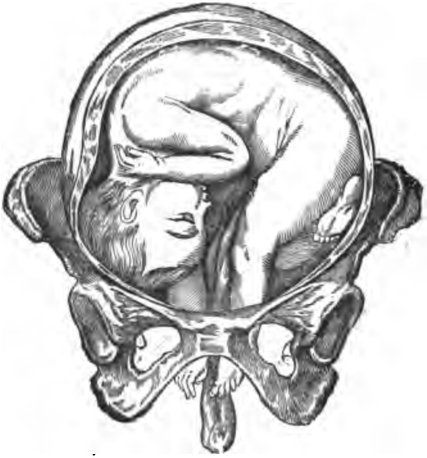

Fig. 42.—Prolapse of Feet with Arms and Cord.

CHAPTER VIII.

ANOMALIES OF THE UMBILICAL CORD.

Knots in the cord are evidences of the mobility of the fœtus, because they are produced by the fœtus slipping through a loop of the cord. They may be formed early in pregnancy, and by subsequent movements be pulled so tight as to lead to atrophy of the Whartonian jelly at the places of pressure (Fig. 43). But they never are tight enough to interfere with the circulation through the cord.

Loops round child.—Often labour comes on before the fœtus has had time to slip entirely through a loop of the cord, and it is born encircled with the cord. The older the fœtus and the bigger it is, the harder it is for it to slip through loops in the cord. Winding of the cord round the fœtus is found in about 1 case in 5. There is generally only one loop, but as many as eight or nine have been seen. Both such winding and knots in the cord usually occur with very long cords. These loops often encircle the neck, and by compressing the vessels in the neck they may endanger the life of the child. When the winding round the neck has occurred early in pregnancy, the neck has been found extraordinarily thinned by the compression. Intra-uterine amputation of limbs, circular grooves in the limbs, and shrinking in their

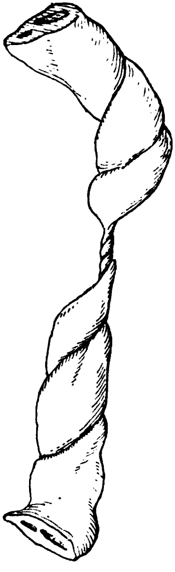
Fig. 43. — Atrophy of Whartonian Jelly from Torsion of Cord.

growth, have been ascribed to the pressure of loops of the cord, although these effects are much more often, and probably always, due to bands of the amnion. When twin children have succeeded in kicking or tearing through the amnions which separate them in utero, the cords may get intertwined in a very complicated way.

Shortening of cord.—Besides these less common effects, twisting of the cord round the child renders the cord relatively short, and this may cause the same complications in labour as absolute shortness of the cord. From all these occasional effects, it results that the proportion of stillborn and dead children is higher among those around whom the cord is twisted than in others. The pressure effects of loops of the cord are produced during pregnancy; the effects of its shortness during labour.

Shortness of the cord.—The cord may be absent altogether, the placenta forming the anterior abdominal wall (a rare malformation); or its length may be a few inches only. Under tension it will stretch. A cord that when stretched measures less than ten inches will hinder delivery unless the placenta is inserted very low down. But a much longer cord may be rendered relatively short by being twisted round the child; and this is far commoner than absolute shortness of the cord. If the cord is absolutely or relatively so short that before the child is expelled the cord is stretched, the tight cord will hinder its advance.

Effects.—The following may be the results :—

(1) *Breaking.* The cord may break. Dr. Matthews Duncan found that the breaking strain of the cord was from 5½ to 15 lbs., and that it averaged about 8¼ lbs. The strongest part of the cord is that near the placental insertion. As the average force by which delivery is completed is about 40 lbs., it might be expected that this would be a frequent solution of the difficulty.

(2) *Separation of placenta.* It is presumed, on theoretical grounds, that the traction on the cord might separate the placenta. But this has never

been observed, and if it were looked for, it would be very difficult to be sure that the traction of the cord was the sole reason of the detachment of the placenta. It is, therefore, believed that this *may* happen, but it is not known that it *has* happened.

(3) *Inversion of the uterus.* The pull of the cord may invert the uterus. This is the way in which a considerable number of cases of inversion of the uterus are brought about, and is the most serious danger that shortness of the cord can give rise to.

(4) *Rotation of fœtus.* If the cord is rendered relatively short by being coiled round the child, the child's body may rotate during delivery in such a direction as to undo, or partly undo, the coiling of the cord. Such rotation, or evolution, as Dr. Matthews Duncan termed it, brings the child's abdomen anterior, because the less depth of the anterior part of the pelvic cavity causes the shortest possible line between the placental and the fœtal ends of the cord to be in front.

Diagnosis.—The only way of detecting that delay in the advance of the child is caused by shortness of the cord, is by feeling the cord, and perceiving that with each slight advance of the child during a pain it is made tense.

Treatment.—The only treatment is to cut the cord and secure the fœtal end with the fingers until the child has been born, and then tie it. When the case has been naturally ended by rupture of the cord, it is generally broken off close to the umbilicus, and the torn end of the artery contracts so that the cord seldom bleeds. Should it bleed, pinch up between the finger and thumb about an inch of the abdominal walls, exactly at the lower edge of the umbilicus, and you will feel the cord of the hypogastric arteries. Then pass a needle or pin from side to side through the abdominal wall *underneath* the vessels. Your finger and thumb will keep the intestines out of danger of transfixion. The pressure of the needle will stop the bleeding. Withdraw the needle in twenty-four hours.

DESCENT OF THE CORD.

Modes of descent.—Descent means that the cord comes down by the side of the presenting part (Fig. 44). Three conditions are included under this term: *Presentation* of the cord (sometimes called *chorda prævia*), when the cord presents at the os uteri at the beginning of labour; *prolapse* of the cord, which signifies that the cord falls downwards when the bag of membranes bursts; and *expression* of the cord, which means that the cord is squeezed out by the side of the presenting part later in the process of labour. In the first two conditions the cord can often be returned, but in cases of expression of the cord, if it be put back it will be squeezed out again directly. Whether the cord lies outside the vulva or not is a matter of no importance. The cord usually comes down at the sides of the pelvis,

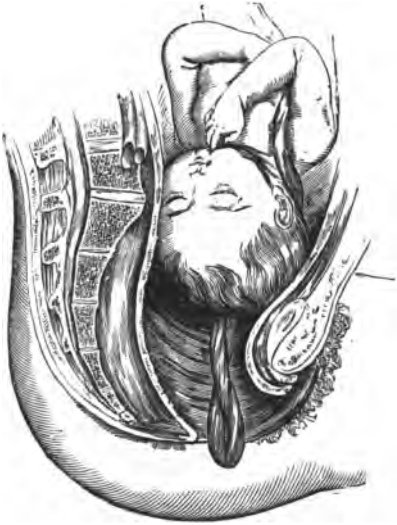

Fig. 44.—Prolapse of Cord by the Side of the Head.

seldom either in front of the promontory or behind the symphysis.

The frequency of prolapse of the funis is probably about 1 in 300 cases.

When and why important.—Descent of the cord is a matter of no consequence to the life of the mother, but it greatly endangers the life of the child, because it leads to the cord being compressed between the head and the pelvis. When the child is born with the pelvic end first, the cord is always compressed for a little while between the head and the pelvis; but then the soft parts have been dilated by the body of the child, so that the head is quickly born, and in a case otherwise normal the cord is not compressed for more than a minute or two. But if the head presents, and the cord comes down by its side, the cord is compressed during every pain while the soft parts are being dilated by the head, which may take several hours; and in such a case the child is pretty sure to be dead. If the breech presents, there is plenty of room between the limbs and the body for the cord to lie in while the soft parts are being dilated, so that it is not pressed on till the head comes through. Therefore, in cases in which the head does not present, prolapse of the cord is a practically unimportant condition.

Causes.—Prolapse of the cord is generally produced by some other abnormal condition. In normal labour both prolapse and expression of the cord are prevented by the completeness with which the head as it descends into the pelvis fills up the os uteri, so that the cord cannot get past it. In *transverse* and in *breech presentations* the presenting part does not so nicely fill the os uteri as the head does. Hence, prolapse of the cord is commoner with these presentations than with head presentations. The conditions which prevent the head from coming down to dilate the os often cause the head to be in a faulty position; therefore, in *face*, *brow*, *transverse*, and *occipito-posterior positions* of the head, prolapse of the cord is commoner than with the normal vertex presentation with the occiput in front. Among the causes which hinder the natural presentation and engagement of the head are an *excess of liquor amnii*, as has been explained when dealing with shoulder presentations. This has an especial tendency to the production of prolapse of the cord, over and above its influence in preventing the proper engagement of the head; for when the membranes rupture the sudden pouring down of such a quantity of fluid is very apt to carry down with it the most movable of the solid contents of the uterus, viz. the cord. In twin pregnancy abnormal presentations are common, and therefore prolapse of the funis is common.

Contraction of the pelvis is a very frequent cause of prolapse of the cord. This accident has been estimated to occur six times as often in contracted pelves as in well-shaped pelves. About one-third of cases of prolapse of the cord occur in contracted pelves. Remember these facts, and when you find the cord down always examine carefully the size of the pelvis. Contraction of the pelvis causes prolapse of the cord, not only directly, by preventing the head from coming down into the os uteri, but also indirectly, by favouring the production of abnormal presentations. The same causes that lead to prolapse of the funis lead also to prolapse of the hand: and if the hand come down, this will keep open a way by which the cord can come down.

Prolapse of the cord is rather more frequent in multiparæ than in primiparæ, because in the former the abdominal walls have been previously stretched and are therefore more relaxed, and do not so efficiently help to keep the presenting part in the pelvic brim as they do in patients who have not before been pregnant. Implantation of the placenta low down in the uterine wall, and of the cord at its lower edge, thus bringing the uterine end of the cord near the os, has been supposed to favour its prolapse; but we have no evidence in support of this. Unusual length of the cord must evidently favour prolapse; but great length of the cord is not so often productive of prolapse as might be expected, because when the cord is very long it is usually made relatively short by being coiled round the body of the child.

The immediate cause of *prolapse* of the cord is generally rupture of the membranes, the flow of fluid carrying the cord with it.

Diagnosis.—The diagnosis of prolapse of the cord ought to be easy. If the cord be pulsating there is nothing with which it can be confounded. When rupture of the uterus or vagina has taken place, and bowel come down, the coils of intestine have been mistaken for umbilical cord. It is difficult to imagine how such a mistake can be made by anyone in full possession of his faculties, for the bowel is attached by a mesentery, while the coils of the cord lie free. But the mistake has been made.

Prognosis.—Rather more than half the children whose cords come down during labour are stillborn. Two-thirds of those that present with the head die. The *post-mortem* appearances, other than those that may have been produced by operative delivery, are those of asphyxia. The pressure on the cord deprives the child of its supply of oxygenated blood. The prognosis is worse the earlier the cord comes down. It is worse also the earlier the membranes burst. Before the rupture of the bag of waters, the cord is either not pressed on at all, or only pressed on during the pains, being protected from pressure during the intervals between the pains. The prognosis is worse also if the cord comes down in front, between the symphysis and the head, than if it descends behind, for in the latter situation it will be, or may be, pushed opposite one sacro-iliac synchondrosis, where there is more room for it than in the conjugate diameter of the pelvis.

Treatment: First stage.—(1) *Preserve bag of membranes.* The result for the child when the cord descends is very largely dependent upon the treatment. Seeing that while the membranes are entire the cord is only exposed to slight and intermittent pressure, the first aim of treatment is to keep the membranes unruptured as long as possible.

(2) *Postural.* The treatment of prolapse of the cord before rupture of the membranes is very simple. It is, to put the patient on her knees and elbows (Fig. 45). In this position the uterus is nearly vertical, the os uteri being the highest part, the fundus the lowest. Therefore the cord, which can move easily in the bag of membranes, sinks down to the fundus of the uterus.

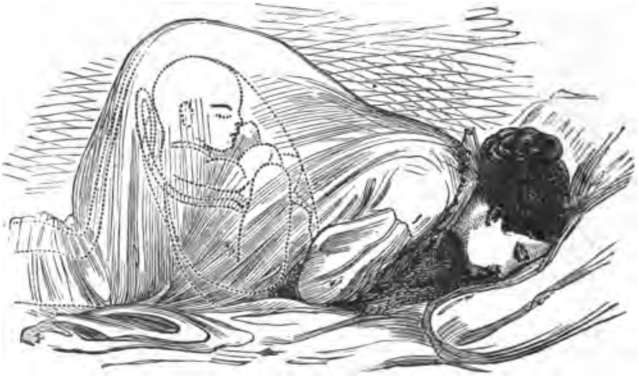

Fig. 45.—Postural Treatment of Prolapse of Funis.

The patient should be kept in this position for fifteen or twenty minutes, to give the cord time to sink to the fundus. Then she should lie on the side opposite to that on which the cord came down, in the hope that as uterine contractions drive the head down upon the cervix, the head will so fill it as to leave no room for the cord to come down again. The patient should be kept recumbent, and told to avoid straining, that rupture of the membranes may be postponed as long as possible. Should the cord come down again, the patient must be again put on her knees and elbows. This is a method of treatment that cannot do any harm. It not only gets the cord away from the os uteri, but it postpones rupture of the membranes, because in the knee-elbow position the os being the highest part of the uterus, the weight of the bag of membranes and its contents, instead of pressing into the os and thus acting in the same direction as the force exerted by uterine contraction, presses towards the fundus, and thus opposes the uterine contractions. Hence, labour goes on more slowly while the patient is in the knee-elbow position. This retardation of labour, and the possibility that the patient may find the knee-elbow position wearisome, are the only drawbacks to this simple mode of treatment, and these drawbacks are not weighty.

After rupture of the membranes this simple mode of treatment is not enough, although it may still be found helpful. It may be sufficient if employed soon after rupture of the membranes, before all the amniotic fluid has escaped. But if it be found that when the patient is put on her knees and elbows the cord does not go back, then it is necessary, for the sake of the child's life, to do one of two things, either

(1) to put back the cord; or
(2) to deliver quickly.

There are two exceptions to this statement. The first is when the cord is quite pulseless, and the fœtal heart cannot be heard, so that it is clear that the child is dead. (Do not think that the child is dead merely because you do not feel pulsation in the cord, for the circulation through the cord may have only recently been interrupted, and the child may be still living, and its heart beating, although the blood has for a little while ceased to flow through the cord.) If the cord is pulseless, listen for the fœtal heart, and watch the state of the cord for five or ten minutes. If the child is dead, there is nothing to be gained by interfering. The second exception is when the pains are very strong and frequent, and it is certain that the child will be soon born. Here you cannot improve upon matters; therefore, let well alone.

Replacement of the cord is the ideal method.

The chief objection to it is that prolapse of the cord is generally secondary to some other complication of labour, *e.g.* contracted pelvis; and if the cause of the prolapse is still present, the cord will come down again. Many instruments have been devised with which to replace the cord, and it is possible with some of these to damage the uterus; as most of them have fallen into disuse, it may be inferred that they are not of great utility.

(*a*) **Manual.**—The best mode of replacing the cord is with the hand. An anæsthetic is not necessary, but the patient may wish it. Put the patient on her knees and elbows, or on her side if she be anæsthetised. Put the thumb and fingers of the hand together so as to form a cone, and pass the hand into the vagina. If the loop of cord be a small one, take it between the tips of the fore and middle fingers; if it be a large one, in the palm of the hand, and *between the pains* carry it up *past the greatest diameter of the head.* It is of not the least use only to push the cord up a little way, or to push up part of it; the whole of it must be carried past the largest measurement of the head. If, when this has been done, the cord again comes down, it is no use repeating this manœuvre; the only chance for the child is in speedy delivery.

(*b*) **Instrumental.**—The *instruments* for replacing the cord that can be improvised at the bedside are as good as those specially constructed for the purpose. A clean catheter can be used. Pass the ends of a bit of string in at the eye and out at the end, so as to leave a loop projecting at the eye. If you are not dexterous enough to do this, cut a hole in the catheter opposite the eye, and pass a loop of tape or string through the two openings. Or take a piece of whalebone, and with a gimlet or pocket-knife make a hole in it near one end, and through the hole pass a piece of string or tape so as to form a loop. If your catheter has a stilette, withdraw the stilette until it is not visible at the eye. Then put a loop of string or tape into the eye, and advance the stilette through the loop so that the stilette may hold the loop in place (Fig. 46). Then tie the ends of the loop together so as to form a ring in which the cord may be held. Whichever mode you adopt, having snared the cord, pass the catheter up into the uterus, carrying the cord with it. When the cord has been thus carried up, loosen the noose if you can, or leave the catheter in its place—it will not take much room (Fig. 47). If you have been able to use a catheter with a stilette, withdraw the stilette, and the loop is free. These methods are not so good as replacement by the hand. They bring with them a slightly increased risk of septic infection, a little danger of injuring the fœtus, uterus, or placenta; and a great likelihood that the cord will come down again as soon as the replacer has been removed.

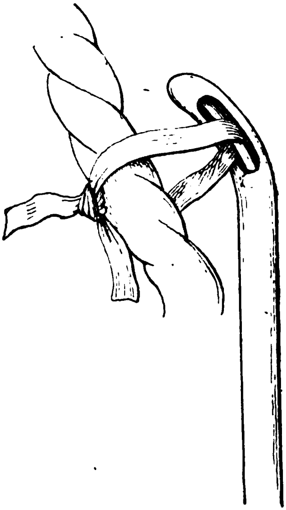

Fig. 46.—Cord snared by Catheter with Stilette.

If reposition fails, the only resource is *delivery in such a way as to shorten the duration* of the pressure on the cord.

If the pelvis is normal, and the head not of abnormal size, and the cord has simply been carried down by the rush of the liquor amnii, it will remain up if properly replaced. But if the pelvis is contracted, it will almost certainly come down again, however well it is put back.

Indication for turning.—In contracted pelvis, therefore, with prolapse of the funis, the best plan is to perform podalic version and bring down one leg. It is possible that the cord may then remain in the recess between the leg that remains bent up and the body.

Indication for forceps.—If the first stage of the labour is near its end, the os uteri being dilated to three-quarters of its full size, the best plan will be to hasten delivery with forceps.

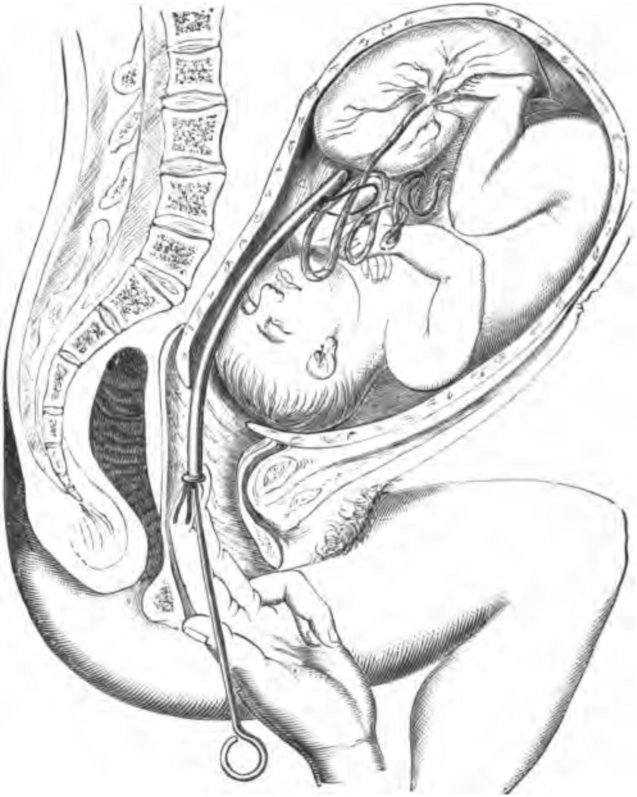

Fig. 47.—Replacement of Cord by Catheter. (*After R. Barnes.*)

In short, therefore, in cases in which after reposition the cord again comes down, and the conditions are not fit for forceps delivery, turn and bring down the feet. In prolapse of the funis with flat pelvis, having a conjugate diameter of not less than three inches, and head above the brim, you need not try to replace the cord, but turn by the feet at once.

CHAPTER IX.

TWINS.

Usual course of labour with twins.—Each twin has its own amnion, and generally its own chorion. The os uteri is stretched open exactly as in labour with a single child by the bag of waters belonging to the twin that lies lower. When the os is fully dilated, the membranes burst, and the child is born as in an ordinary labour. Then the os uteri partly recontracts. After a short interval the pains return, the bag of waters of the second child is forced on into the os, and as the passage has been well dilated by the first child, it yields easily to the second, which is quickly born. Then the placentæ follow. The placenta of the first child is not as a rule separated from the uterus till after the birth of the second child, and therefore there is not generally hæmorrhage during the labour.

Presentations in twin labour.—Abnormal positions are far more frequent in twin than in normal labour, because when the presenting part of one twin has got into the brim, there is not room for the other as well; and this twin has to adapt itself as best it can to the space left for it. The causes which make the head usually present, and the child lie with the back in front, act in twin pregnancy as they do in normal pregnancy, and therefore head presentations, although they do not preponderate so much as in normal labour, yet are still the most numerous (Fig. 48). In two-thirds of twin cases, both twins present with the head. Generally the backs are in front, and the two heads occupy opposite oblique diameters, for the obvious reason that mutual adaptation is thus easier than if they lay side by side in the same oblique diameter. In rather more than one-fourth of the cases the head of one child and the breech of the other lie together. In about one case in twenty, one of the children presents transversely. Transverse positions during pregnancy are far commoner than this, but often, after the birth of the first child, the uterine contractions rectify the oblique position of the other, and bring its head or breech into the brim.

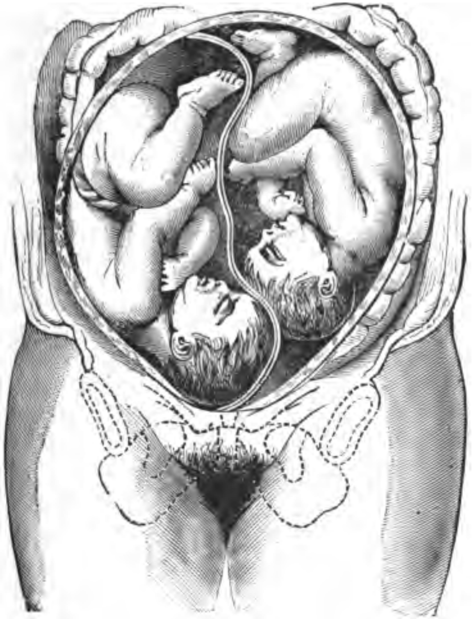

Fig. 48.—Twin Pregnancy: both presenting with the head.

Order of delivery.—If one child lie with the head, and the other with the breech over the pelvic inlet, the child whose head is downwards is usually born first. If one child lie transversely, and the other in the long axis of the uterus, the one in the long axis of the uterus is the first to be born. If both lie with the head down, and they are unequal in size, the larger is born first. The interval between the births of the first and second twin is in three-fourths of cases less than an hour.

Exceptional events.—When each twin is the result of the fertilisation of a separate ovum, each has its own chorion and placenta. (Each twin always has its own amnion, for this is a fœtal membrane. Cases in which the two fœtuses have seemed to lie in a common amniotic cavity are simply cases in which active children have kicked a hole in the membranous partition formed of the two amnions.) When this is the case, after the birth of the first child its placenta may follow. If this happen, the second child may be retained for several hours, days, or even weeks. Such long retention as the last mentioned is very rare, and only happens when the two ova were fertilised at different times, so that the growth of one is not complete when its co-twin is expelled. It has happened also that after the birth of the first child both placentæ have been expelled. This is very rare; it only occurs if both placentæ are situated low down on the uterus—if each is, in fact, nearly or quite prævia. Placenta prævia is very rare with twins, for reasons given in the chapter on that subject.

Complications of twin labour.—In twin pregnancy the uterus is abnormally distended because its contents are more bulky than usual. This abnormal distension makes its action weak. Hence weak pains are commoner in twin labour than in normal labour. The uterus becomes sooner exhausted than in a normal labour, and hence uterine inertia in the third stage of labour, with its consequence, post-partum hæmorrhage, is more common than after normal delivery. Abnormal presentations bring with them the same effects in the course of labour as in single pregnancy—premature rupture of membranes, etc.—and expose the mother to the same slight increase of risk from the necessity for operative intervention. The greater distension of the uterus raises the pressure within the belly, and as this increased pressure is one of the factors which produce the kidney disease and eclampsia of pregnancy, these complications are commoner in twin pregnancy than in normal pregnancy. In about one-fourth of twin pregnancies labour comes on prematurely.

Duration of labour.—The duration of labour with twins is not upon the average longer than in single pregnancies, notwithstanding the liability to weakness of pains. This is because the children are generally small, so that the soft parts need not be stretched open so much to let the children pass. The uterus is weak, but its task is easier. The average length of labour is further abridged by the frequency with which, owing to abnormalities in the course of labour, delivery is artificially hastened.

Prognosis.—The mortality of the children, from the frequency of premature labour, of abnormal presentations, and the smallness and weakness of the children even if born at term, is more than twice as great as in normal labour. The prognosis for the mother is rather worse, from the frequency of the complications mentioned above.

Rules for delivery in twin pregnancy

1. If after the first child is born the membranes of the second child still remain entire, wait for half an hour. If within that time the placenta of the first child is expelled, do not hasten the birth of the second. Wait another hour, and then, if no uterine action take place, and there is no hæmorrhage, leave the patient, and tell her to send when the pains return. The two children may, as has been explained above, be of different intra-uterine age, and the second child may be retained for days or weeks.

2. If half an hour after the birth of the first child its placenta has not been expelled into the vagina, and the membranes of the second child are still unbroken, find out how the second child is presenting, and if it be with the head or breech, rupture the

membranes. If any other part present, pass your hand into the uterus, seize a knee (in doing which you will rupture the membranes), bring it down, and deliver.

3. If the membranes of the second child have already ruptured, manage the delivery just as in an ordinary labour. If the head or breech is advancing, and pains are strong, let it alone. If pains are weak, assist by pulling. If the presentation be transverse, turn and extract.

4. In any case take more care than usual to prevent post-partum hæmorrhage. Give a dose of ergot as soon as the children are born.

Beside the complications which may occur in any labour, and which are described elsewhere, there are some which are peculiar to twin labours.

Interlocking of twins.—In twin labour the children may obstruct one another, in various ways.

1. *When both lie with the head downward.*

In this case it is possible that as the head which is in advance sinks into the pelvic cavity, the head of the second child may be driven against its neck, pinning it, as it were, against the brim of the pelvis. If the children are small, the head of the second child may come through the pelvis with the chest of the first. If this does not happen help will be needed. The course which will suggest itself, as the head is engaged in the pelvis, is the use of forceps. When you seize the head and pull, you will find a difficulty in bringing it through the pelvis or even making it move, which the absence of all signs of impaction did not lead you to expect, and which you will be unable to account for either by the size of the head or the pelvis or the soft parts. This state of things will call for careful examination. Bimanual examination will reveal to you a hard round globe, the second head, above the one which you have grasped in the forceps. You may not at first form a correct opinion as to what this globe is, but when you have made out its presence the treatment will be clear, viz. to push it

up or aside if possible, that the child whose head you have seized with forceps may be brought down.

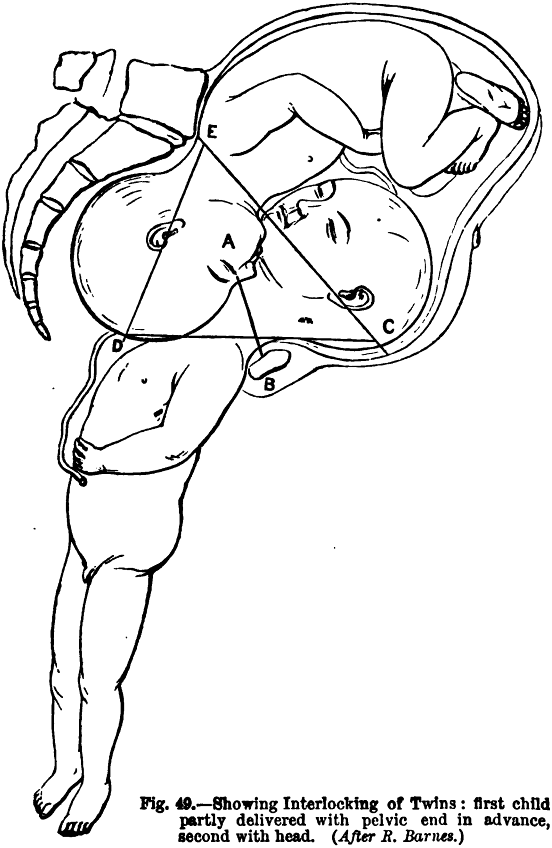

Fig. 49.—Showing Interlocking of Twins: first child partly delivered with pelvic end in advance, second with head. (*After R. Barnes.*)

A B, Plane of brim; E C D, wedge formed by head of first child and neck of second.

2. *One child may lie with the pelvic end, the other with the head down.*

In this case, it is possible that when the legs have been extracted, and the trunk has entered the pelvis, the head of the second child may get locked below the head of the first, preventing it from coming down. There are various ways of this locking. The two heads may interlock chin to chin, the face of one looking to the neck of the other (Fig. 49). The chin of one may be pressed into the nape of the neck of the other. The occiput of each may be pressed into the nape of the neck of the other. The head of one may be pressed against the side of the neck of the other. In this case, if the children are small enough, they may both come through together, in spite of the locking. If the advance of the first child is hindered, careful examination will detect the hard round mass which, with the chest of the partly-born child, fills the pelvic brim, and you will at once perceive that this is the cause of the delay.

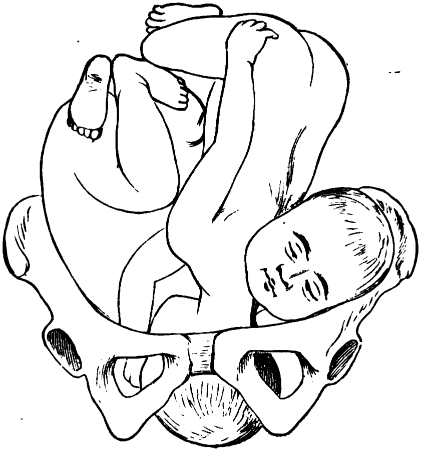

Fig. 50.—Showing Interlocking of Twins: head of first child descending into pelvis, second child lying transversely. (*After Charpentier.*)

In treatment, the first thing to be done is to see if you can disengage the interlocking. If the uterus is not contracting strongly, you may be able, by pushing up the partly-born child, to release the impaction, so that you can push up and out of the way the head of the second. Supposing that you cannot do this, consider which life is the more valuable, that of the first or the second child? If delivery is not speedy the first child is sure to be stillborn. The second child is therefore the one which you have the best chance of saving. The best treatment is to sever the body of the first child from the head. The head will slip up, and then with forceps you can seize the head of the second child and deliver it.

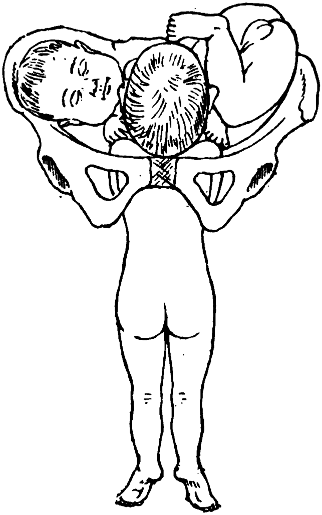

Fig. 51.—Locking of Twins: one fœtus partly delivered with breech in advance, the other lying transversely. (*After Charpentier.*)

3. *One child may lie transversely, the other presenting either with the cephalic or pelvic extremity.*

In this case it is possible, whether the head or breech descend first, that the child which lies transversely may get so jammed against the neck of the child which has advanced into the pelvis as to hinder the descent of the shoulders if the head presented (Fig. 50), the head if the breech presented. The diagnosis of this form of obstruction is only to be made by careful bimanual examination. The treatment consists in pressing aside the child which is obstructing delivery, while you pull on the other. If the first child presented by the breech or feet, and the pulsation in the cord has ceased so long that it is certain the child is dead, the trunk may be detached, and then the second child be delivered by turning (Fig. 51). But in this case decapitation is neither so necessary nor so advantageous as when the head of the second child is jammed below the head of the first. One important rule in all impactions of this kind, is to abstain from giving ergot. This drug will kill the fœtus, make manipulation difficult and dangerous, and do no good.

CHAPTER X.

MALFORMED CHILDREN.

CERTAIN malformations of the child make delivery difficult. These will now be described. I mention only those which cause difficulty in delivery; there are many others, of much embryological interest, but not important obstetrically.

General enlargement of the child.—Labour may be difficult simply because the child is of excessive size. In the early months of pregnancy the head is much larger as compared with the trunk than it is at birth, and at birth the head is relatively much larger than in children a few months old. In accordance with these facts we find that in children whose intra-uterine development is excessive, the shoulders are larger in comparison with the head than is normal. With such a child, the excessive size of the shoulders may greatly obstruct delivery. The shoulders may be so large that they will not enter the brim, and thus prevent the head from being born. If the pelvic end present, the shoulders may stick in the brim and prevent the head from coming down.

Attempts have been made to get a mode of accurately measuring a part of the fœtus accessible through the vagina—the sagittal suture, or a foot, according to the position of the child—and from this to calculate the size of the child: an application of the proverb, "*ex pede Herculem.*" But at present the difficulty of correct measurement makes this of no practical use. You may roughly guess from the size of the foot or the suture as to the bulk of the whole fœtus: but that is all.

This mechanical impediment can only be found out by the obstacle it causes to delivery. The os uteri is retracted, the head engaged in the pelvic cavity and advance ceases. The head is not impacted, and the forceps can be easily applied, but pulling does not make the head advance. If there is neither in the pelvis, nor the uterus, nor the fœtal head anything to hinder progress, the cause of delay must be in the child's body. The only thing to do is first to perforate the head, thus gaining access to the chest, and then to diminish the size of the chest either by opening it with scissors or by cutting off an arm. Such cases are very rare.

It is commoner to find that after the head is born the shoulders so tightly fill the pelvis that their delivery seems impossible. The only way to assist it is to pull *during the pains* on the head, and pull at the same time with a finger in the axilla. Put a finger in the anterior axilla, and carry the head backwards, so as to get the anterior arm under the pubic arch. If you can do this, by pulling the head forwards make the posterior shoulder sweep over the perineum; or you can then disengage the anterior arm. If you cannot reach the anterior axilla, or cannot get it down, carry the head forwards, so as to make the neck hug the symphysis, and get your finger over the posterior axilla, so as to pull it down, and then either by pulling the head backwards make the arm press back the perineum so that you can get the anterior shoulder under the pubic arch; or you may disengage the posterior arm. In bringing out the arms take care to do it by pressure on the elbow, not on the humerus, for by the latter mode you will very likely break the arm.

If you cannot get down the shoulders with your fingers you may try the blunt hook. This instrument differs from the finger in being stronger, and not susceptible of fatigue. But with it you can very easily damage the humerus or the shoulder joint.

If nothing succeeds, perforation of the chest is the only course that remains; but cases of this kind, in which evisceration is called for, are infinitely rare.

If the child has presented by the breech, and there is great difficulty in getting the chest through, evisceration may be done early without scruple, because in such a case the pressure on the cord is pretty sure to kill the child.

Fœtal anasarca.—Children sometimes become the subjects of general dropsy while in utero. We know very little of the causes of this condition. It is believed, for plausible reasons, to be due (*a*) to disease of the placenta. The placenta depurates the blood in the fœtus as the kidney does in the adult. Therefore as kidney disease in the adult causes dropsy, so, it is thought, placental disease causes dropsy of the fœtus. (*b*) To anasarca of the mother, the disease of the mother affecting the fœtus also. (*c*) To disease of the heart or great vessels of the fœtus, dropsy being produced just as it is by similar conditions in the adult. (*d*) To syphilis. But with each of these conditions which are supposed to cause dropsy of the fœtus, it is the case that children are oftener born without dropsy than with it. Why it is that some such children should be dropsical but the majority not, we do not know.

Fœtal emphysema.—Sometimes a decomposing fœtus becomes greatly swollen from evolution of gas. Difficulty may thus be caused, but not frequently on account of the softness of the fœtus.

Treatment.—As these children are either dead, or die soon after birth, the treatment of difficulty from this cause is evisceration.

Hydrocephalus. — This is rare (Fig. 52). Different statistical tables show a frequency of from 1 in 1,000 to 1 in 3,000. We know nothing about the causes of intra-uterine hydrocephalus, and therefore we cannot prevent it. It does not produce any symptoms during pregnancy, and therefore cannot be diagnosed without examination. It formidably obstructs delivery, and as it has often been overlooked it has often led to rupture of the uterus.

Effect on labour.—In hydrocephalus the child hardly ever lies transversely; either head or breech presents. Head presentation is the more common, but breech presentations occur oftener in hydrocephalic than in healthy children.

Liability to rupture of uterus.—Hydrocephalus, when the head presents, exposes the mother to more danger than usual of rupture of the uterus. It does this in two ways. First, the head is so large that it cannot enter the brim, and therefore, if no relief is given, the regular results of obstructed labour follow, viz. tonic contraction of the uterus, ending either in death or uterine rupture. Second, there is with hydrocephalus a greater tendency than usual for tonic contraction of the uterus to end in uterine rupture, because, owing to the head being unnaturally large, the lower uterine segment has to be unnaturally stretched as the retracting uterine body pulls the lower uterine segment up. Abnormal stretching and therefore abnormal thinning, bring abnormal liability to rupture.

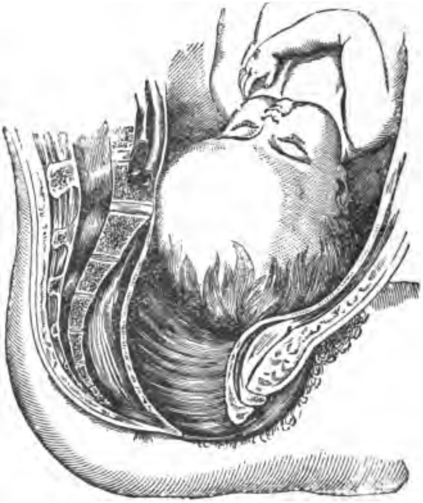

Fig. 52.—Hydrocephalus of the Fœtus.

How naturally delivered.—Statistics show that the results of labour with hydrocephalus are rather better with extreme enlargement of the head than with slight. This is partly because the extreme cases are sooner diagnosed and treated. It is also partly because in extreme cases nature sometimes overcomes the difficulty. When the ventricular wall and calvarium are very expanded and tense they are thinned, and burst more easily. Then the fluid escapes between the calvarium and the scalp, and under pressure readily makes its way along the cellular tissue; the skull then collapses, and natural delivery may follow.

Hydrocephalus with breech presentation seldom ends fatally for the mother, because every accoucheur knows that it is no use prolonging efforts to deliver the obstructed after-coming head, and therefore perforation is generally performed soon.

Diagnosis.—The diagnosis of hydrocephalus is easily made. It is not always diagnosed because it is rare, and therefore accoucheurs sometimes do not think of it. If the head is presenting, the condition is identified by discovering (1) on abdominal examination the great size of the head, which lies high above the pelvic brim, together with (2) vaginal examination which reveals the wide separation of the cranial bones at the sutures and fontanelles. Sometimes this is so great that a fontanelle presenting at a slightly dilated os uteri, may be taken for the bag of membranes. Hydrocephalus of the after-coming head can only be diagnosed by abdominal palpation. But here, as has been pointed out, the correct line of treatment is usually clear whether the diagnosis has been made or not.

Treatment.—The ideal treatment is to tap the dropsical head with a trocar, draw off the fluid, dilate the cervix if necessary with a water bag, and then perform podalic version when it is fully dilated. In this way there is a slender chance of a living child being delivered, which, after giving a great deal of trouble to its mother and nurse, will probably die within a year, but has a remote chance of growing up into a deformed imbecile. The usual treatment (as a trocar and cannula are not generally carried in the obstetric bag) is to perforate and deliver with the cranioclast or cephalotribe as soon as the diagnosis is made. This is safer for the mother, as there is a slight risk of rupturing the uterus in introducing the hand for turning. The after-coming hydrocephalic head has been known to burst under traction used for delivery. The proper treatment is to perforate as soon as it is clear that the head is so large that it cannot be delivered quickly.

Anencephalus.—The commonest monstrosity is the anencephalic fœtus. In this the cranium is absent so that the base of the skull is uncovered by bone. Sometimes the upper part of the spinal canal gapes also. In place of a proper brain, the base of the skull is filled with what looks like granulation tissue, but is really imperfectly formed cerebral matter.

Anencephalic fœtuses are either born dead or die very soon. Life extending over days is rare.

There are three *abnormalities in labour* which commonly go with anencephalic fœtuses. The *first* has relation to the amount of liquor amnii. More or less excess of liquor amnii is the rule, we do not know why. The *second* has reference to the mode of presentation. If the defect does not extend beyond the skull, the head presents in a position between flexion and extension, and the examining finger comes upon the base of the skull, covered by soft tissue in the middle of which the sella turcica can be felt. This resembles nothing else that is ever felt in a labour and settles the diagnosis. If the defect involves the upper part of the spine as well as the skull, the face presents. The *third* feature is, that the shoulders of anencephalic fœtuses are often very broad, so much so as to obstruct delivery.

The *treatment* of difficult labour with an anencephalic fœtus obviously is embryotomy. If the shoulders give difficulty, amputate the arm or perforate and empty the chest.

Morbid enlargement of the fœtal body.—Delivery may be impeded by morbid enlargement of

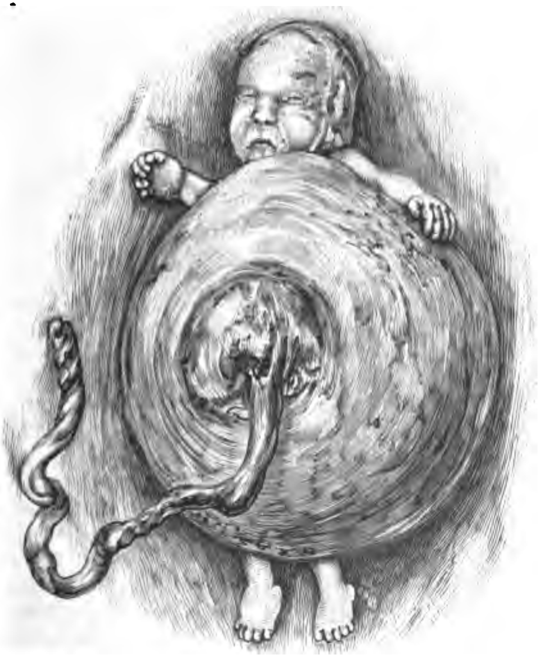

Fig. 53.—Fœtus with Distension of urinary Bladder from imperforate Urethra. (*After Schwyzer.**)

the fœtal trunk. The diseases by which such enlargement is generally caused are hydrothorax, ascites, distension of the urinary bladder, cystic disease of the kidneys. The distension of the belly by the latter diseases may be enormous, so that the head and limbs look like small appendages to the big round trunk

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* *Arch. für Gyn.*, Bd. xliii.

(Fig. 53). Fortunately such very diseased children are generally born prematurely.

Fœtal ascites is generally, not always, due to syphilitic disease of the liver. *Distension of the bladder* comes from the urethra being imperforate. In *cystic disease of the kidneys* these organs are converted into a mass of cysts, in size from a pin's head upwards, and by this change enlarged; they have been found weighing several pounds. The cysts arise by the stopping up of renal tubes, possibly by concretions of urinary salts.

Children with swelling of the chest or belly generally present with the head, but present with the breech oftener than healthy children do. Head presentations are to breech as about two to one. The length of the neck usually allows the head to be delivered, and then the swollen chest or belly sticks in the pelvic inlet. When the pelvic end presents, the legs are delivered easily, and then progress is arrested.

The *diagnosis* cannot be made until the difficulty in delivery arises. It is then made by excluding other causes of obstruction.

The *treatment* consists in perforating the trunk at the most accessible place, so as to diminish its size.

Tumours of the fœtus.—Congenital swellings of parts of the fœtus are met with. From the back of the head (more rarely from the front) an *encephalocele* or *meningocele* may project. From the sacrum there may project a *spina bifida*. A *teratoma*—that is, a tumour consisting of part of a second fœtus—may be attached to the sacrum. A similar tumour may be attached to the jaw, either in the neighbourhood of the orbit or the gums: this is called *epignathus*.

These tumours are, as a rule, only obstetrically important by reason of the perplexity they may cause the accoucheur in making out the position and presentation of the child. They are soft and movable, and therefore rarely cause difficulty in delivery.

Double monsters.—These monsters consist of two fœtuses more or less blended together. Their mode of production does not come within the scope of this work. Nor is a knowledge of their classification according to the kinds of deformity essential to the practice of midwifery. I here only regard them from the point of view of the accoucheur.

Obstetrically they may be divided into three classes:—1. Those in which one end only of the fœtus is double. 2. Those in which there are two fœtuses loosely connected. 3. Those in which there are two fœtuses closely connected.

1. Those in which one end only of the fœtus is double. Here we have the diprosopus (δίς, twice, πρόσωπον, the face) with double face; the dipygus (πυγή, the buttock) with double pelvis, and allied forms. The kind of difficulty when the cephalic end is double is like that due to hydrocephalus. The cephalic end is of unusual size, and if it will not pass must be perforated. The diagnosis can only be made by careful exploration with the whole hand. If the diagnosis is made in time, turning will be advantageous for the same reason as in hydrocephalus. If the pelvic end be double, then the kind of difficulty will be like that due to ascites or hydrothorax; the head will be delivered and then the pelvic end will stick fast. Careful examination is the only way to identify the difficulty. The treatment is to bring down the feet one by one, or if you cannot do that, to cut up the pelvis with strong scissors.

2. The second group is composed of monsters in which two fœtuses are united at one end only, either at the head (cranio-pagus, πάγος, from πήγνυμι, I make fast), or the breech (ischio-pagus, pygo-pagus). In these cases the fœtuses are so far movable upon one another that it is possible in cranio-pagus for one fœtus to be born with the breech presenting, and the second to follow with the head in advance. Hence when this condition is diagnosed, which can only be done by careful examination with the hand in the

uterus, a foot should be brought down. When the fœtuses are united at the pelvic end, one child can be born with the head in advance, and then the second as in a breech presentation. Hence in these cases the difficulty is little if at all greater than in an ordinary twin labour.

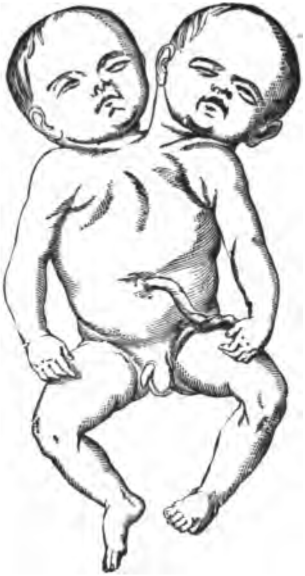

Fig. 54.—Double-headed Monster.

3. The third group includes cases in which the double formation is more extensive than in the first group, and the union closer than in the second. It includes the various kinds of double-headed monsters (Fig. 54), and twins united side to side, back to back, or belly to belly. In these cases of large duplication and close union, when the head or legs of one child come down into the pelvis, the other child may lie across the pelvis; and hence, if the monster be large, delivery be very difficult. If the monster be not very big it is possible that, if one of the heads present, the second head may come through the pelvis along with the thorax corresponding to the first head. A similar mode of transit is possible if a breech or legs present. A third possibility is that, with the second child lying transversely, a process like that of spontaneous evolution may take place.

It is very little use laying down rules for the management of cases like these, for they are hardly ever diagnosed in time for a choice of treatment. Experience has shown that the best way is for the feet to come down, and therefore, if you should diagnose a double monster early in labour, bring the feet down. In practice the treatment comes to this: help delivery by pulling if required. If you cannot deliver in this way, and there is no obstruction arising from the size and shape of the pelvis, carefully examine. If you have a double monster to deal with, deliver by embryotomy.

CHAPTER XI.

ABNORMAL UTERINE ACTION.

In the foregoing chapters I have described the difficulties in delivery which depend upon abnormal position or conformation of the child or children. In this I shall describe the abnormalities of uterine action which are associated with delay in delivery.

What are natural labour pains?—For labour to be natural, not only must the child be living, of not more than average size and weight, and presenting in the most favourable position, but the labour pains must be normal: that is, uterine contractions must recur with such force and frequency that the child is born within twenty-four hours from the time at which the pains began. The average length of labour is less than this. A labour which lasts as long as twenty-four hours is therefore usually in some way abnormal, although the causes of delay may be too trifling to call for interference. Twenty-four hours is an arbitrary but convenient limit, which gives nature time to overcome the slighter hindrances to delivery. If the labour is natural in every respect but duration, the patient will not suffer harm from protraction for not longer than twenty-four hours.

The common abnormalities of pains.—Cases of lingering labour were classified by Burns,* as follows:—

First: "The pains may be from the beginning weak or few, and the labour may be long of becoming brisk." This is *primary uterine inertia*, or *weak uterine action.*

Second: "The pains during the first stage may be sharp and frequent, but not effective, in consequence of which the power of the uterus is worn out before the head of the child has fully entered into the pelvis, or come into a situation to be expelled." This is *secondary uterine inertia* (Scanzoni), *temporary passiveness* (Braxton Hicks), or *uterine exhaustion.*

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* "Principles of Midwifery."

Third: "The pains during the whole course may be strong and brisk, but from some mechanical obstacle the delivery may be long prevented, and it may even be necessary to have recourse to artificial force." This is *obstructed labour.*

In these sentences the common forms of lingering labour are clearly defined. The distinction between them is of the utmost importance; it is the very foundation of sound practice in midwifery. They are quite different from one another, and need quite different treatment. It is therefore necessary to consider them more fully.

Kinds of uterine inertia.—You will notice that the term *uterine inertia* has been applied to two conditions, distinguished by the prefixes *primary* and *secondary.* These two conditions are altogether different from one another. Let me point out the differences.

Both kinds of uterine inertia about to be described are often, indeed usually, associated with other complications of labour. But for the sake of clearness I assume, in describing them, that the labour is in other respects normal.

Primary uterine inertia, or **weak pains.**—This means, that "the pains are from the beginning weak or few." In a natural labour, when the soft bag of waters bulges into the os, the pains recur at comparatively long intervals, and cause but little suffering. When the hard head comes to press into and more powerfully stretch open the os, a greater reflex effect is produced, and the pains become more frequent and stronger. As the head descends and dilates, first the vagina, then the vulva—parts more richly supplied with sensitive nerves—the pains follow one another still more quickly, and the driving force of each uterine contraction is helped by powerful expulsive efforts of the diaphragm and the abdominal muscles. In a labour lingering solely from primary uterine inertia, the course of the pains is as in a normal labour; except that the intervals are longer, the acceleration of the pains as the labour passes into the second stage is less marked: the pains are shorter and weaker, and are accompanied by less vigorous bearing-down efforts. The advancing part of the child is not pressed onwards so powerfully; and hence many pains produce but small progress.

Physical signs.—If the labour be delayed solely by this cause, there is no obstruction. With each pain the presenting part of the child advances, and when the pain goes off it recedes. The caput succedaneum is slow in formation. The mother's pulse is regular, and not quickened. The expression of her face is not anxious. Put your hand on the abdomen, and you will find that between the pains the uterus is relaxed, and that if, as is probable, the abdominal walls are relaxed also, you can make out the outline of the child distinctly. During a pain you will feel the uterus get hard, and rounded in shape, and will notice also that the patient feebly, if at all, assists the pain by bearing down. When at length the child is born, the third stage goes on in a perfectly satisfactory manner. The uterine contractions, which were too weak to quickly overcome the resistance of the pelvic floor, are quite equal to expelling the placenta and stopping bleeding afterwards.

Secondary uterine inertia, or **uterine exhaustion.**—Contrast this with *secondary uterine inertia.* Here, in the beginning of the labour, the pains follow one another as fast as, and are quite as strong, as usual. The labour goes on well at first, but good uterine action does not continue long enough to expel the child. But after many hours of vigorous action the uterus gets tired, the pains get less frequent and less strong, and at length may cease altogether. If the patient is let alone she will probably sleep for an hour or two, and then the pains will come back with renewed vigour. If she is too tired to sleep the pains will continue infrequent and weak, or remain absent altogether until she is rested. Dr. John Ramsbotham * relates a case of this kind, in which labour was thus suspended for sixty hours, and then uterine action was resumed, and labour safely ended.

Practical difference.—The practical difference between these two conditions—primary and secondary uterine inertia—is of the highest importance.† They are these:—In *primary* uterine inertia you may with advantage help delivery by pulling; by forceps if the head present, by the fingers or by bringing down a leg if the breech present. The pulling should be during the pains, not between them; strive to help the uterine action, not to replace it. In this condition acceleration of delivery will save the mother protracted pain and prevent exhaustion.

But in *secondary* uterine inertia delivery is the worst possible practice, because it is certain to be followed by dangerous post-partum hæmorrhage. Passiveness of the uterus is of no consequence while the child is within it and the placenta still attached. But it is a most deadly peril when the placental sinuses have been laid open.

In *primary* uterine inertia ergot will stimulate the uterus, so that instead of short contractions at long intervals, first more frequent contractions, and then a continuous tonic contraction is produced. In *secondary* uterine inertia ergot has no effect, because the nervous power of the uterus is exhausted. If the child is dragged away, and the natural consequence—post-partum hæmorrhage—follows, ergot is powerless against it. The right way to treat secondary uterine inertia is by giving the patient sleep, and in this condition the surest sedative is opium. Give the patient a grain of opium, or ♏xv of tr. opii, and if she is not asleep in half an hour, repeat the dose.*

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* "Observations in Midwifery," vol. i. p. 246.

† I think it unfortunate that the term uterine inertia should have been applied to conditions so different. I should prefer to banish the term, and call one "weakness of pains," and the other, either by the name given to it by Braxton Hicks, viz. "temporary passiveness of the uterus," or by the more expressive name of "uterine exhaustion." But, as both these conditions are comprised in text-books of repute under the head of uterine inertia, I am obliged to retain it, and follow Scanzoni in distinguishing the two very opposite conditions by the adjective *primary* and *secondary*.

Causes of weak pains.—We know very little about the causes which make the pains weak in one woman, strong in another. Weakness of pains does not depend upon any condition of ill health in the mother that we can identify. In the last stage of exhausting diseases labour is often quick and easy; and lingering labour from weak pains is often seen in women who look robust. Weakness of the pains undoubtedly depends on some constitutional peculiarity, for it occurs over and over again in successive labours of the same patient. Its production is favoured by age and child-bearing, for it occurs most often in elderly multiparæ. It has been said that it runs in families, that it occurs in women who early in life have suffered from chlorosis; that it is frequent in Europeans who go to live in hot countries; but I know of no evidence that has been brought forward in support of these assertions. Some German writers say that it is due to a developmental defect in the uterus—a view inconsistent with its comparative infrequency in first labours. Another says that it is from fatty degeneration, owing to one pregnancy following another too quickly, but brings forward no proof either of the fatty degeneration or the occurrence in quickly following pregnancies. In short, in a great many cases we cannot assign any reason for the weakness of the pains.

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* The following quotation will show that this is no new discovery: "I therefore advised patience, and ordered her a carminative clyster and an opiate draught, with orders to repeat the latter six hours after, in case the first did not answer; this was the method which Dr. Chamberlain (the most noted practitioner in midwifery in his time in England) always pursued where the pains were irregular or weak; it being his opinion that forcing medicines did more harm than good, which I have always found verified in my own practice."—Giffard, "Cases in Midwifery," London, 1734, p. 333. The Dr. Chamberlain referred to was the inventor of the forceps. The quotation shows that he not only knew the use of his instrument, but *when not to use it.*

Too much liquor amnii stretches and thins the uterine wall, and thus undoubtedly makes the pains weak. The contractions being weak the bag of membranes is imperfectly pushed into the os, and thus the reflex stimulus which should call forth contractions is deficient. When the membranes burst, the head may come down on the cervix, and fill it so that a great quantity of fluid is still retained and the uterus cannot grasp the child, straighten it out, and so force on the head. In such cases it is an old observation that putting in one blade of the forceps, thus keeping open a channel for the escape of liquor amnii, is often followed by better uterine action.

Adhesion of membranes.—Sometimes the membranes are more firmly adherent than usual to the uterus. This will prevent the bag of membranes from moving on into the os, bulging into and stretching it. This normal reflex stimulus being wanting, pains are weak. Put in your finger, sweep it round the os, and detach the membranes. Then the bag will be able to move on and bulge into the os; and quicker and stronger pains will come on.

Temporary weakness and slowness of pains may be produced by various minor causes. *Fulness of the bladder* is one. Its effect has been attributed to alteration in the shape of the uterus, produced by the full bladder; also to the full bladder causing bearing-down efforts to be painful. The latter explanation is the more satisfactory; for it seems to me more likely that the uterus alters the shape of the bladder than the bladder that of the uterus. Whatever the explanation, relief to the bladder will do good. This reflex effect of a full bladder in its normal position is a different thing from the obstruction to labour which sometimes is caused by fulness of a *displaced* bladder. In natural labour, the uterus pulls up the anterior vaginal wall, and with it the bladder, so that this organ is in the abdomen in front of the uterus and above the pubes, quite out of the way of the child. Occasionally, in patients who have suffered from cystocele, the full bladder may be found in the pelvis in front of the presenting part of the child, obstructing its progress, the bladder being prevented by its distension from rising. I have seen this; Dr. Lever described several cases.* The treatment, of course, is to draw off the urine, and then the uterus can pull up the bladder.

Fulness of the rectum is another cause of temporary weakness of pains. This is usually manifest early in labour; for in the second stage, if the rectum be full, the descending head squeezes the fæces out before it. To avoid this disagreeable process, as well as to help the first stage, it is desirable always to see that the rectum is cleared out early in labour.

Emotion will sometimes suspend for a time uterine action. The frequency with which the entrance of the accoucheur into the room, to use a common phrase, "frightens away the pains," will be familiar.

I have spoken of the "pains" without differentiation of their component parts. The pains may be weak, either from the action of the uterus being weak, or from the *auxiliary efforts of the abdominal muscles* being absent or weak, or from both causes. It makes no difference as to the treatment which of these conditions it is that makes the parturient forces weak.

It is hardly needful to say that the amount of suffering manifest is no criterion whatever of the force of the uterine contractions.

Relative weakness of pains.—When we speak of "weak" or "strong" pains, we mean weak or strong relatively to the resistance that has to be overcome. The pains may be weak, but if the child be very small it may be quickly born. The pains may be of quite average strength, but the resistance may be greater than usual, either from great firmness of the soft parts, or from exceptional size of the child. The pains are too weak for their work. This is "relative weakness of pains." The rapidity of labour depends upon the relation between the force and frequency of the pains and the resistance they have to overcome. As the amount of resistance is very variable, and we have no means of measuring it, we cannot draw any hard and fast line between weak pains and obstructed labour. Theoretically, a broad line may be drawn. In normal labour, all that the uterus has to do is to stretch open the soft parts. With a normal pelvis and a fœtus of average size, the bones offer no resistance whatever to delivery. If, this being the condition of the pelvis and child, the pains are unable to dilate the soft parts within the average limit of time, they are weak. If the progress of the child is hindered by disproportion or malposition or disease, so that the resistance is abnormal and greater force than usual is required, then the pains are only relatively weak.

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* See also a paper by Sir W. H. Broadbent, Obst. Trans., vol. v.

In practice we cannot draw this distinction so clearly. We have no means of measuring the amount of resistance, or of dividing that due to the bony pelvis from that due to the soft parts. In extreme cases, of marked weakness or marked obstruction, the differential diagnosis is easy; but there are intermediate cases in which labour is slow, and it is difficult to say whether the pains are absolutely or relatively weak. The diagnosis between absolute and relative weakness of pains is not so important as that between secondary uterine inertia and conditions which resemble it, as the treatment of absolute and relative weakness is the same, viz. to assist the weak uterus by pulling.

Treatment of weak pains.—*First stage of labour.* So long as the liquor amnii is retained, no harm whatever comes to mother or child from weakness of the pains. Other concomitant troubles may be present: the mother may feel sick and be unable to take food, or she may be unable to sleep. The relation of these troubles to weak pains is more often that of cause than of effect. Support the patient's strength by giving liquid food in small quantities, and give sedatives to enable her to sleep; but so long as the first stage of labour is going on naturally in every respect save the weakness of the pains, do nothing to hasten it.

In the *second stage of labour*, if weakness of the pains is the only cause of delay, no serious mischief can come from waiting. Pains too weak to dilate the soft parts within the average time cannot produce injurious pressure effects. But the pains of the second stage cause more suffering and exhaust the mother more than those of the first stage; and therefore if the second stage is let go on for many hours the patient will get very tired. Secondary uterine inertia may come on. After a sleep pains will return, and the patient be delivered. But as it is a safe and easy thing to help weak pains by pulling, it is good practice, when the pains of the second stage are regular, but weak, to save the patient fatigue and pain by forceps or by breech traction. Instruments have been devised (called toco-dynamometers) for accurately measuring the strength of the pains. But they are of no practical use: for a statement of the amount of force the uterus can exert has no bearing on the length of labour unless we know also the resistance it has to overcome. The only test of weak pains that we have is the rough one of time. The second stage is usually over in less than two hours. If then, in a labour in which the alternate advance and recession of the head and the absence of a great caput succedaneum show there is no obstruction, the second stage is not finished in two hours, you may presume that the pains are weak, and may give help.

Action of ergot.—In primary uterine inertia *ergot* is most useful. It is a drug as powerful for harm in the wrong cases as it is for good in the right ones. It changes the natural intermittent contractions of the uterus into powerful *tonic*, that is, continuous, contraction, and then, if there is no obstruction, delivery is quickly finished. It does this by its specific action on the nervous ganglia of the uterine muscle. If the nerve force of these ganglia is exhausted, ergot will not act. Hence it is of no use in secondary uterine inertia. If the labour is delayed not from weakness of the pains but from obstruction, ergot will put the patient in imminent danger of rupture of the uterus. Further, the tonic contraction of the uterus hinders the circulation through the utero-placental vessels, thus diminishes the supply of oxygen to the child, and, if its delivery is delayed, causes its death by asphyxia. For this reason, ergot should not be given early in the first stage of labour, for then, even if there be no obstruction, the labour will be so long that the child will probably die. The fact that the child is in peril from this cause can be found out by listening to the fœtal heart.

Effect of uterine action on fœtal heart.—The natural changes which take place during a pain are, that as the contraction of the uterus is coming on, the fœtal heart becomes quicker. At the height of the contraction it is slowed. As the pain is passing off it beats faster again, and, when the contraction has quite gone, returns to its natural rate. If ergot is given, the contraction is continuous, does not pass off; and the fœtal heart does not return to its natural rate. The heart is first slowed, then made intermittent, and then stops. If you find the heart very slow and intermitting, you must deliver at once, or the child will be stillborn. If ergot is given in the second stage of labour, and the child is not quickly born, there is probably obstruction.

Indications for ergot.—The administration of ergot in the second stage of labour is good practice only if it is certain that there is no obstruction. You may feel pretty sure of this (1) if the labour is premature. In labours before the end of the seventh month it is always good practice (except when the pelvis is much contracted) to give ergot in the second stage. (2) If the patient has had easy labours before, with children of full size and weight; examination shows that the presentation is normal and the child not of excessive size; and there is no abnormal condition in the pelvis obstructing delivery. And if ergot fails to produce delivery within half-an-hour, forceps should be used. You can form an idea of the size of the child by palpating the abdomen, and by ascertaining that the child's head has sunk down into the pelvis, so that its greatest diameter is not above the brim, and yet it is not impacted. If the head is impacted; if its greatest diameter is above the brim; if abdominal palpation gives the impression that the child is of unusual size, ergot ought not to be given. The good rule is usually laid down that *ergot ought never to be given in first labours.* This is because it is so difficult to detect the minor degrees of pelvic contraction, also because the soft parts in a first labour are so firm that they stretch slowly, and the powerful propulsive force called up by ergot is likely to tear them.

Other oxytocics.—Other uterine stimulants besides ergot have been recommended. Borax, quinine, pilocarpin, digitalis, cannabis indica, warm baths, friction to the abdomen, electricity, have been said to be oxytocics. There is no drug which has any effect on the uterus anything like as great as that of ergot. There are many preparations of ergot; but the ordinary Pharmacopœial liquid extract, obtained from a good chemist, and given by the mouth, is the best. Quinine and warm baths act on the uterus indirectly, as food and sleep do, by refreshing the patient, but not so well. Friction and electricity stimulate the uterus a little. Pilocarpin, digitalis and cannabis indica only do harm.

Delay caused by hydramnios.—If the amount of liquor amnii is so great as to distress the patient by its bulk, rupture of the membranes is the way to give relief. If it is not so great as this, slowness of the labour is a less evil than the effects of premature rupture of the membranes; therefore, let the bag of membranes dilate the cervix, even though it do so slowly.

Obstructed labour.—Labour may be protracted, not because the pains are weak, but because there is a mechanical obstacle to delivery.

This is obstructed labour. We are indebted to Dr. Braxton Hicks for first fully and accurately describing the effects of insuperable obstruction to delivery. When, either because the pelvis is too small, or the child too large or in a wrong position, the uterus is unable to expel it, the rhythmical pains occur at shorter and shorter intervals, until at last there is no interval at all, and the uterus is continuously contracted: there is *tonic contraction of the uterus.* When this stage is reached the liquor amnii has all escaped, and the tonic contraction no longer tends to expel the child by straightening it out and pressing down the part at the fundus, but grasps it and becomes moulded to it. The uterus is a very large muscle, exerting great power in its contraction; its contractions, therefore, even when intermittent, consume much nerve force, and in proportion exhaust the patient. When they become continuous, they exhaust the patient still faster. The length of time after which exhaustion comes on, differs in different women; the difference depends upon the nervous tone of the patient, not upon the muscular power or the state of her tissues. As the uterine contractions do not generally follow one another with extreme rapidity until they are excited by the reflex effect of the presence of the head in the cervix or vagina, tonic contraction of the uterus seldom comes on until the second stage of labour. It may occur in the first stage, but is then not only rarer, but more slowly produced. It most quickly comes on when the head is in the pelvic cavity, because then the surface pressed on is larger, therefore more nerves are compressed, and they are compressed more powerfully, being squeezed between the head and the pelvic bones. The result is exhaustion of the mother, not only by muscular exertion and pain, but by bruising and perhaps sloughing of soft parts nipped between the head and the pelvic bones. The fact that the symptoms come on just the same when the head is not presenting, and therefore the soft parts are not subject to destructive pressure, shows that the muscular effort and pain are the chief agents in prostrating the patient, and that pressure on the soft parts plays a minor part. The uterine nerves come mainly from the sympathetic, the system of nerves which most directly influences the vital processes.

Symptoms.—The symptoms of exhaustion which accompany tonic contraction of the uterus are slow and insidious in their approach. The first symptom is that the expression of the face becomes anxious; then the pulse gets quicker and smaller. The patient's breathing is hurried in proportion to the pulse. Her tongue becomes first creamy, then yellow, then brown. Her lips get parched. She becomes restless. There may be vomiting. If the patient is not delivered, these symptoms get more and more marked until she dies. Dr. Hicks has found the tonic uterine contraction persist up to within a few minutes before death.

Treatment.—When tonic contraction of the uterus has begun, immediate delivery is the only treatment. Every hour adds to the danger; and the danger of delay is greater the farther the labour has advanced. Dr. Hicks estimates that the danger from delay when the head is in the pelvic cavity is ten or twelve times greater, and when it is impacted at the outlet eighteen to twenty times greater, than when it is still in the uterus.

Obstructed labour may end in rupture of the uterus either before or after uterine contraction has become tonic. The mode of production of this accident I shall describe in a subsequent chapter.

Importance of diagnosis between uterine inertia and tonic contraction of the uterus.—One of the greatest practical blunders that can be made is in the mistaking tonic contraction of the uterus for secondary uterine inertia, otherwise called temporary passiveness, and the reverse. Therefore pay careful attention to the *diagnosis between tonic contraction of the uterus and secondary uterine inertia.* Tonic contraction of the uterus and secondary uterine inertia present certain superficial resemblances. In both, regular pains have ceased. In both, the patient and her friends may think the labour has lasted too long, and be clamorous for delivery. But yet the diagnosis between them is of extreme importance, for the treatment is diametrically opposite. In tonic contraction of the uterus immediate delivery is absolutely necessary: in secondary uterine inertia it is the worst possible practice, for it ensures post-partum hæmorrhage. Therefore, I give the differential diagnosis in a tabular form.

The points of difference are as follows:—

Secondary uterine inertia, otherwise called **temporary passiveness, and uterine exhaustion.**	**Tonic contraction of uterus.**
A. As to the patient's general condition.	
Expression placid: at most showing signs of fatigue: not anxious.	Expression of face tired and anxious.
Pulse not over 100.	Pulse small and quick; generally 120 or over.
Breathing not hurried.	Breathing hurried in proportion to pulse.
B. Abdominal examination.	
Uterus not tender.	Uterus tender if condition has lasted long.
Outline and limbs of child can be distinctly felt, and child moved about.	Outline of child cannot be felt, but only that of hard and immovable uterus: limbs of child cannot be felt.

C. Vaginal examination.

Presenting part can be pushed up easily.	Presenting part cannot be pushed up.
Caput succedaneum small, so that sutures can be felt.	*If head in pelvic cavity*, great caput succedaneum, so that sutures cannot be felt.
Little or no swelling of vagina and vulva.	*If head in cavity* vagina and vulva swollen.

Remember also the contrast in

D. Treatment.

Give the patient sleep: do not deliver her.	Deliver without delay.

In tonic contraction of the uterus ergot ought never to be given, because its effect is to cause this condition and increase it when present.

Prevention.—You ought never to allow the uterus to get into a state of tonic contraction. The conditions which lead to insuperable obstruction ought to be found out quite early in labour: for they are easy to ascertain. Contraction of the pelvis, great enough to prevent the delivery of a living child, ought to be noticed when you make your first examination, and if suspected, the pelvis should be measured. A transverse position of the child ought to be found out and corrected early in labour. If the child, or part of it, be so large with relation to the pelvis that it cannot enter it, this ought to be ascertained early in the labour: and if it be certain that the child cannot pass through the pelvis, the alternatives of embryotomy or Cæsarian section should be put before the patient: and the mode of delivery, upon which she, with the help of your advice, decides, should be carried out without delay.

Premature uterine retraction. — The three above described are the common varieties of lingering labour. There is another kind, first described by Litzmann,* and brought before English readers by Matthews Duncan.† This condition is rare. I have seen one case. It occurs chiefly in young primiparæ, of

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* *Arch. für Gyn.*, Band x.

† *Obst. Journal*, vol. v.

nervous temperament. The uterus is morbidly active. Its retraction goes on with injurious rapidity. The intermittent contractions are of ordinary duration, and force complaints from the mother; but they are inefficient, and may justly be called spasmodic. Contraction of the uterine body, and stretching and thinning of the cervix and lower uterine segment, go on as in obstructed labour. The uterine body, which at the beginning of labour covered the whole fœtus down to the brim of the pelvis, becomes a mere cap or dome-like covering of the part of the fœtus which is at the top of the uterus. Its fundus is higher in the abdomen than it otherwise would be (because the child is straightened out, but not driven down), and extends downwards over the fœtus only to two or three finger-breadths below the navel, or even less. The pains are severe, but inefficient. The head may in such a case be found near the perineum, and be delivered with ease. After the child is born the placenta is easily expelled, and hæmorrhage is very unlikely. The bearing down efforts are either unaffected or powerful. The main feature is that the ring of Bandl (see chapter xx.) is quickly raised to near the umbilicus as labour goes on, its hard edge marking the limit between the part of the uterus which contracts and that which stretches. The body above, hard and firm, allows nothing to be felt through it while the pain lasts; the cervix below, thin and tight during a pain, and even then allowing fœtal parts to be felt through it. This retraction of the body and stretching of the cervix is the same thing as occurs in obstructed labour, but *there is no obstruction.* The morbid condition is that retraction is premature. In these cases ergot will do harm by increasing the retraction of the body. If the conditions are favourable, delivery by forceps or breech traction is indicated; if not, opiates or chloroform.

There are other anomalies of the pains which need mention.

Partial contraction of the uterus.—This is believed to occur, for the following reasons:—First, the placental site has been observed after delivery much thicker than the rest of the uterus, and it has been supposed that this thickening was due to local contraction of the uterus at that part. In my opinion it is explained by the greater vascularity of the uterine wall where the placenta is attached. Second, when the hand has been introduced into the uterus during labour, a ring of narrowing has been felt, which has been called a stricture, and been supposed to be due to a localised contraction of a circular ring of uterine tissue. Such strictures are not found in normal labour. They occur with transverse or breech presentations, with contracted pelvis, with tonic contraction of the uterus. In the first case the apparent stricture is the imperfectly dilated internal os. The membranes protrude through the os; and before the os is fully dilated, the portion of the bag of membranes which bulges through it not being protected by the presenting part from the full pressure within the uterus, may become so big that it fills the vagina, and gives the attendant the impression that the os is fully dilated. If now the membranes rupture, a so-called stricture is felt. In a breech presentation the breech may come down through an imperfectly dilated os, which will not let the head pass, and then the head seems to be detained by a stricture. These events are especially likely to happen in premature labours, in which the cervix dilates badly. In obstructed labour the liquor amnii gradually drains away—or, rather, is expelled—so that when the uterus gets into a state of tonic contraction, hardly any liquor amnii is left, and therefore the uterus must closely embrace the child and adapt itself to the fœtal outline; and then, at the parts where the circumference of the child is small, there seems to be a stricture.

The so-called strictures are thus produced, not by partial contraction of the uterus, but by imperfect dilatation, or by an abnormal condition of the uterine contents. In shoulder presentation the shoulder may get caught below an imperfectly dilated internal os, and thus difficulty in version be caused.

The treatment of these strictures depends upon their cause. There is no such thing as a labour, in all other respects natural, being delayed by a stricture of the uterus or by partial contraction of the uterus.

Precipitate labour.—Precipitate labour means labour which goes on too fast. As a general rule, the quicker the labour the better for the patient. There are two ways in which the labour may seem too quick.

1. *Apparently precipitate.*—In a patient whose sensibility to pain is not acute, the labour may go on with so little pain that she does not know how far labour has advanced, and delivery suddenly takes place before she expects it. The patient may be delivered while standing, or while sitting on the closet. The child may be injured by the fall. If the cord is so short that the drop of the child makes it tense, it usually breaks off at its weakest part—that is, close to the umbilicus; the vessels retract, and hæmorrhage is stopped. But if the cord is strong and the uterus lax, the sudden pull on the cord may invert the uterus. The only way to prevent these accidents is by observing the rule always to go as soon as sent for. The fault here is, not that the pains are abnormal, but that the patient does not know how far labour has advanced.

2. *Precipitate labour*, properly so-called; in which the pains recur with unusual frequency and strength, so that the child is born more quickly than usual. The only ill result of such vigorous action is that the perineum is more likely to be torn, because the rapidly-propelled head stretches it too suddenly. The way to prevent tearing is to press on the head and keep it back, so that the stretching of the perineum may be gradual. At the same time, tell the woman not to bear down, and take away from her everything that

she can catch hold of to help the straining. The effect of too violent pains may be further counteracted by putting the patient on her elbows and knees, so that the weight of the child may act in opposition to the pains. Lastly, the action of the auxiliary forces may be suspended by chloroform.

CHAPTER XII.

THE COMMON FORMS OF CONTRACTED PELVIS.

Difficult labour often depends on deformity of the pelvis, so that the bony canal, through which the child has to pass, is smaller than it should be.

In this and the following chapters I shall describe the kinds of pelvic contraction, their effect on labour, their diagnosis, and the treatment of labour with them. The first question that arises is—

What is a contracted pelvis?—The answer is, a pelvis which alters the course of labour. In a labour in which the pelvis and the fœtus are of average dimensions the pelvis offers no hindrance to the progress of the fœtus. If the pelvis is so small that the fœtus can only pass through it in a certain way, delivery will be delayed while the head (the largest part of the fœtus) is getting into the position most suited to its transit. The pelvis alters the course of labour, and thus, from an obstetric point of view, it is contracted. The same effect in labour is produced if the fœtus is too large; but, as here the pelvis is not in fault, we do not speak of it as contracted. In speaking of the effect of contracted pelvis upon labour, we assume that the fœtus is of average size and normal conformation.

The most important diameter, and the one most easily ascertained, is the *conjugate*, which measures, in normal pelves, from four inches to four inches and a half. What amount of diminution in the conjugate, then, amounts to contraction of the pelvis? The biparietal diameter of the head averages three inches and three quarters. When the head is in the first position, the measurement that occupies the conjugate is one from a point in front of the left parietal bone to a point behind the right, and this measurement amounts to about four inches. If, then, the conjugate measures only three inches and three quarters, it will alter the mechanism of labour, and the pelvis may be considered contracted. If the contraction is not confined to the conjugate, but affects other diameters as well, there will be an effect on labour with a less degree of contraction of the conjugate. With a conjugate of four inches and an oblique and transverse of four inches and a half, it will be impossible for the head to pass, unless flexion be extreme, for imperfect flexion will bring the occipito-frontal (four inches and a half), or a diameter near it, into the pelvis, and (as the bony measurement is lessened by the thickness of the soft parts) there will be difficulty. Hence a generally contracted pelvis with a conjugate of four inches must be considered a contracted pelvis.

Clinical classification of contracted pelvis.—Pelvic deformities may, from a clinical point of view, be divided into two groups—the *common*, which anyone who for some years has a large midwifery practice is sure to meet with; and the *rare*, which one to whom difficult cases are not specially sent will probably never see. Of course, a general practitioner may meet one of these rare deformities; but they are so much less numerous than doctors that the chances are against it. The common forms are the slighter, but the more important, for in the slight forms the life of the child and the well-being of the mother depend on the way the labour is managed, while the diagnosis and choice of treatment are often difficult. The greater deformities, on the other hand, force themselves on your attention, and dictate their treatment at once.

The common kinds of contracted pelvis are three in number—two kinds of slight deformity, one of great deformity. The common kinds of slight deformity are the *flat pelvis* and the *generally contracted*, or, as I shall call it, the *small round pelvis;* the common kind of great deformity is the ***small rickety pelvis.***

You will understand the deformities better if you follow the mode of their production.

Forces regulating the shape of the pelvis.—The shape of the pelvis is determined by three factors:—

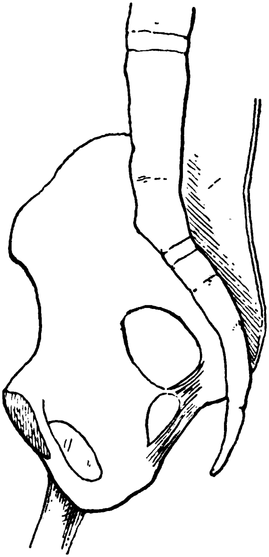

Fig. 55.—Pelvis of Fœtus at Term (*After Balandin.*)

1. The tendency of the bones to grow into their proper shape.
2. The pressure downwards of the weight of the trunk on the sacrum, and the counter pressure upwards of the femora on the acetabula.
3. The pull of the muscles and ligaments attached to the pelvic bones.

Most pelvic deformities result either from (1) softness of the bones from disease, making them yield to pressure and pulling, or from (2) faults in development, which alter the shape of the bones, and therefore alter the way in which the pressure and pulling act on them. The mode in which each deformity is produced can generally be understood by studying the directions of pressure and pulling.

Changes in the shape of the pelvis during growth.—The influence of these forces is seen in the change in the shape of the pelvis which takes place during growth. The fœtal spine is almost straight, and so is the sacrum (Fig. 55). Hence there is hardly any projecting promontory, and the junction between the spine and the sacrum is high above the pelvic brim.

The sacrum is narrower, for its lateral masses are small at birth. The whole pelvis is narrow transversely and more funnel-shaped, the tubera ischii being closer together than at birth. During growth (1) the pressure of the body weight presses the sacrum downwards (Fig. 56); (2) the femora press the acetabula upwards; (3) the growth of the lateral masses of the sacrum widens the pelvis. As the line along which the upward pressure of the femora on the acetabula acts is outside the line of transmission of the body weight from the sacral promontory to the feet, the pressure of the femora, if unopposed, would press the acetabula outwards, and separate the innominate bones from one another. But this outward pressure is opposed by the ligaments which bind the pubic bones together at the symphysis. Divide the symphysis in a cadaver and press the thighs upwards, and you will separate the pubic bones. There is a malformation (the split pelvis, see page 239) in which the pubic symphysis is not united; and in this the femora, instead of pressing the innominate bones together, force them apart, so that there is a wide gap at the symphysis pubis.

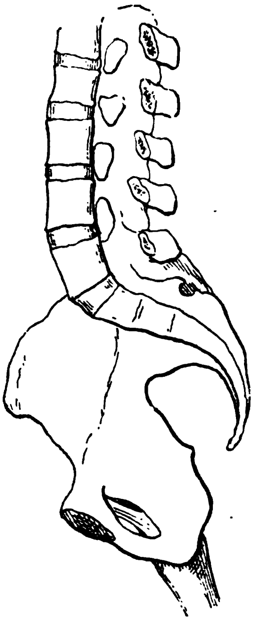

Fig. 56.—Pelvis of Adult. (*After Balandin.*)

Mode of production of the common pelvic deformities.—The change in the shape of the pelvis during growth may be (1) less, or (2) more, than usual, and in either case one of the common forms of slight pelvic contraction is produced.

1. It may be *less* than usual. The sacral promontory may be less pressed down than usual, and the lateral masses of the sacrum not so large. Then we have the *generally contracted pelvis*—a cumbrous name which, in the following pages, I replace by that of the *small round pelvis.*

2. It may be *more* than usual, the promontory of the sacrum being pressed more down and forward than normal. Then we have what is called *the flat pelvis.*

These two forms are the commonest. As the bones, except for these small developmental faults, are normal, the deformity is only slight.

The next most common cause of pelvic contraction, and the commonest cause of *great* deformity, is softening of the bones from rickets. This softening makes the bones yield more to the body weight; hence the deformity is like that of the flat pelvis, but greater in degree, and accompanied with signs of yielding to the pull of muscles and ligaments. Rickets often causes stunting of growth, as well as softening of bones. Hence rickety pelves are often, but not always, small. According to whether this stunting is present or not, we have two forms of rickety pelvis—(1) the *rickety flat pelvis*, (2) the *rickety flat* and *generally contracted pelvis.* For brevity, these may be spoken of as the *rickety pelvis* and the *small rickety pelvis.*

These are the common kinds of contracted pelvis.

The flat pelvis.—The commonest form is the flat pelvis. When there is no other change but flattening, it is called the *simple flat pelvis.* In the following pages this form is meant when the "flat" pelvis is spoken of. From a clinical point of view the size is the only important character. Great flattening is almost always rickety; but it makes no difference in practice whether the deformity is rickety or not.

Causation of the flat pelvis.—We know nothing about the causes of the flat pelvis. It is met with more often in slightly-built under-sized women, as might be expected, for the causes that interfere with the due development of one set of bones are likely to influence the development of others also. But the flat pelvis is sometimes seen in women of full average stature, who are otherwise well and strongly built. It has been said to be produced by the practice of carrying weights on the head in early life. This may be so, but no evidence of it has ever been brought forward; and the flat pelvis is often seen in women who have never been in the habit of carrying weights. It is commoner in the poorer classes, because they are the more numerous; but it has never been shown to be proportionately commoner in them than in the rich. It has been said—and I think it probably true—that this form of contracted pelvis is more common in Germany than in England. But no facts have been adduced in support of this, because I know of no English lying-in charity in which systematic measurement of pelves has been so thoroughly carried out as in the well-officered lying-in hospitals of Germany; nor do the conditions under which English practice is carried on allow pelves to be removed and thoroughly examined after death so frequently as in some other countries. The diagnosis of the slighter forms of contracted pelvis is so difficult that until the pelvis has been measured after death it cannot be said to be quite beyond doubt.

Characters of the flat pelvis.—In the *flat pelvis* the conjugate is the only diameter shortened. A pelvis in which the true conjugate is three inches and three quarters or less, the other diameters being normal, is a flat pelvis. The oblique and transverse measurements may even be larger than in the normal pelvis. The antero-posterior diameters in the cavity and at the outlet are shortened, but not to the same degree as the conjugate. The sacrum is pressed forward as a whole, and not rotated upon its transverse axis, nor altered in shape, as it is in the rickety pelvis (Figs. 57, 58). The posterior sacral spines, owing to the sinking forward of the sacrum, are often depressed slightly below the level of the posterior superior iliac spines; and these spines are also a little closer together than in the normal pelvis. The iliac fossæ look a little more forward than in the normal pelvis, so that the difference between the interspinous and intercristal diameter is not so great as in the normal pelvis. The external conjugate is, on the average, shorter than in the normal pelvis. Its shortening is, in a flat pelvis, seldom enough to justify any inference. The differences in these external measurements that exist between different specimens, both of normal and flat pelves, are so great that no inference can be drawn as to flattening of the pelvis from *slight* variations in these measurements or their relations to one another. The diagonal conjugate, like the true conjugate, is shortened. The pelvis is symmetrical, and there is no curvature of spine.

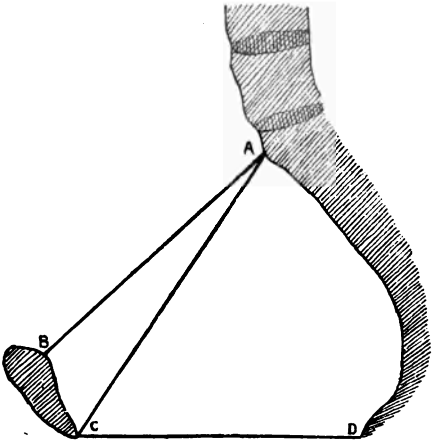

Fig. 57.—Sagittal Section of Normal Pelvis. (*After Pinard.*)
A B, True conjugate; A C, diagonal conjugate; C D, antero-posterior diameter of outlet.

Diagnosis of the flat pelvis. — Measure the diagonal conjugate. This is the principal point. If the conjugate is not shortened, the pelvis is not flattened. If the conjugate is shortened, then you have to find out that the other diameters are approximately normal. Unfortunately, we have no way of accurately measuring during life the transverse diameters of the true pelvis, except in cases of great deformity. You may infer that the pelvis is flat if you find that, while the diagonal conjugate is only four inches and a quarter or less, the interspinous and intercristal diameters are eleven inches and a half and ten inches and a half respectively, or, more than this: if, when you try to explore with your fingers in the vagina the lateral walls of the pelvis, you find you cannot easily do so, and if, when you examine the back, you find the sacral spinous processes sunk below the level of the posterior superior iliac spines. You find also that the patient's limbs are straight, and she is not pigeon-breasted; the pubic interarticular cartilage is not thickened; the lines of junction between the sacral vertebræ are not thickened, and the sacrum is concave from side to side. These latter points tell you that the pelvis is

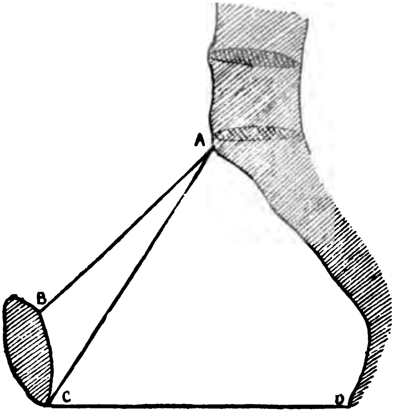

Fig. 58.—Sagittal Section of Flat Pelvis. (*After Pinard.*)

A B, True conjugate; A C, diagonal conjugate; C D, antero-posterior diameter of outlet.

not rickety. If the true conjugate is below three inches and a quarter the pelvis is probably rickety, for contraction so great as this without rickets is very rare.

The generally contracted or small round pelvis.—Those who prefer a Latin name call this the "*pelvis æquabiliter justo minor*" (Fig. 59). I prefer to speak of it as the small round pelvis. It is characterised by deficient development of the lateral masses of the sacrum, as a result of which the transverse diameters are all shortened. The pelvic bones are small, and for this reason the conjugate diameter is shortened, though not so much as the transverse (Fig. 60). The sacral promontory is higher up, so that the diagonal conjugate differs more from the true conjugate than in the normal pelvis (Fig. 61). The sacrum is not quite so much curved from above downwards, but it is slightly more concave from side to side. The distances between the iliac crests and anterior superior iliac spines are less than in the normal pelvis, but the difference between them is as great, or greater. The posterior superior iliac spines are a little farther apart, and the posterior sacral spines often project a little above their level. The external conjugate is shortened.

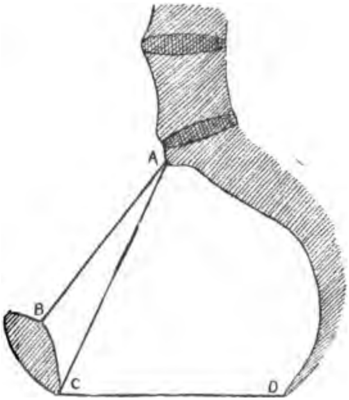

Fig. 59.—Sagittal Section of Small Round Pelvis. (*After Pinard.*)

A B, True conjugate; A C, diagonal conjugate C D, antero-posterior diameter of outlet.

Causation.—We know nothing of the causes of the small round pelvis. It may be found in women in every other respect perfectly developed.

Diagnosis.—This is very difficult. It is usually only discovered by the difficulty in labour. The points are these. The high position of the promontory, and the shortening of the conjugate, and the ease with which the side walls of the pelvis can be felt with the finger. With two fingers in the vagina you can seldom, in a normal or a flat pelvis, easily feel more than the anterior half of the ilio-pectineal line. If you can easily trace the ilio-pectineal line all the way round, the probability is that the pelvis is of the small round kind. This statement cannot be laid down as without exceptions, because the ease with which the ilio-pectineal line can be traced depends not only on the size of the pelvis, but on the length of the examiner's fingers, on the amount of fat in the pelvic floor, the projection of the perineum, and the ease with which it can be pushed up. No positive conclusion can be drawn from slight diminution of the external transverse measurements; but great width of them will contra-indicate general contraction. To these points must be clinically added the kind of

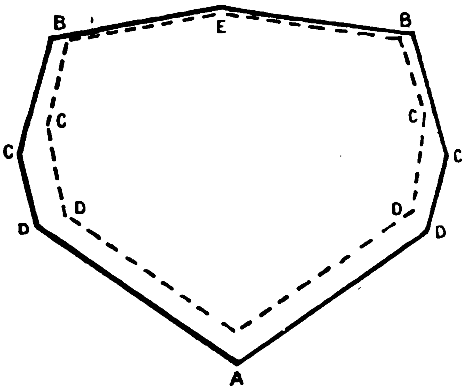

Fig. 60.—Diagram of the Brim of the Small Round Pelvis.

Black line, normal pelvis; dotted line, small round pelvis; B B, sacrum; C C, ends of transverse diameter; D D, ilio-pectineal eminences; E, centre of sacrum in plane of brim; A, symphysis.

difficulty in labour. There is obstruction, and the mechanism is not that of the flat pelvis.'

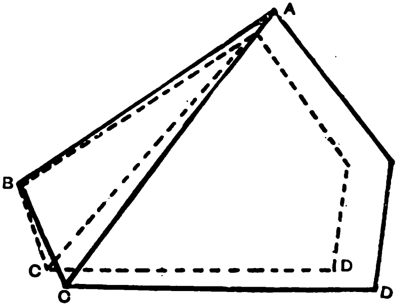

Fig. 61.—Diagram of the Cavity of the Small Round Pelvis.

A B, True conjugate; A C, diagonal conjugate; C D, antero-posterior diameter at outlet; continuous line, normal pelvis; dotted line, contracted pelvis

Rickety pelvis.—The rickety pelvis may be either flat, or flat and generally contracted. The only kind of extreme pelvic deformity that is at all frequently met with in English practice is the *small rickety pelvis* (Fig. 62). The combination of flattening and general contraction of the pelvis without rickets is rare.

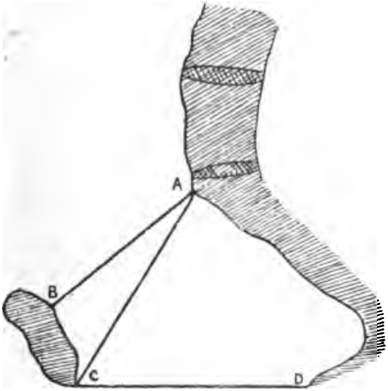

Fig. 62.—Sagittal Section of Flat Rickety Pelvis. (*After Pinard.*)

A B, True conjugate; A C, diagonal conjugate; C D, antero-posterior diameter of outlet.

Signs of rickets.—The signs that indicate that the deformity is rickety are three: (1) Stunting in growth; (2) evidence of softening of the bones; (3) thickening of epiphyses.

(1) Rickety subjects are short-legged, therefore they are generally below middle stature. The shortness of the legs is often increased by bending of the leg bones; and the stature

further diminished by curvature of the spine. The pelvic bones are stunted in growth, as well as distorted, and therefore the wings of the ilia are smaller, and the pelvis is shallow from above downwards.

(2) The bones during growth were soft, and have yielded to pressure and pulling. Hence, besides the curving of the long bones, of the ribs, and of the spine, the pelvic bones are distorted. The sacrum is not only sunk forward as in the flat pelvis, but it is bent (Fig. 63). The upper part of it is pressed down by the body weight, while the lower part is held up by the ligaments which run between it and the ossa innominata. Hence there is a sharper curve of the sacrum at its lower part from above downwards (Fig. 64). The pressure of the body weight on the sacrum falls on the *bodies* of its component vertebræ, while the ligaments which sustain it are inserted chiefly into its lateral masses. Hence, when the sacrum yields to the pressure, the

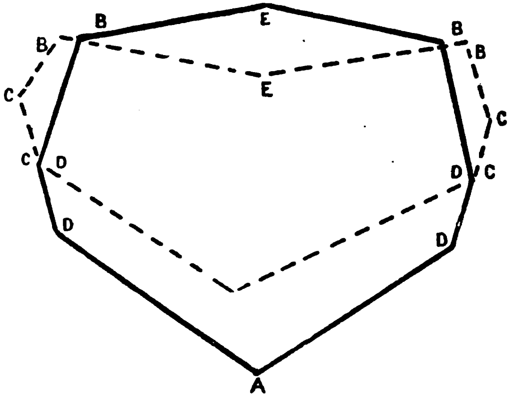

Fig. 63.—Diagram of Rickety Flat Pelvis.

B B, Sacrum; E, centre of sacrum at level of brim; C C, transverse diameters D D, ilio-pectineal eminences; A, pubes; continuous line, normal pelvis dotted line, contracted pelvis.

bodies sink forward, so that the anterior surface becomes flat or even convex from side to side, instead of concave, and the upper part of the sacrum straighter from above downwards (Fig. 65). The bones yield to the upward pressure of the femora, which press the acetabula vertically upwards, and so widen the pelvis. The bones being small, not only is the conjugate shortened, but the transverse dimensions are seldom larger than normal, and sometimes smaller, notwithstanding the widening (Fig. 66). The sacrum is narrow, from imperfect development of its lateral masses. The posterior superior iliac spines are therefore closer together. The bones also yield to the pull of muscles. The glutei pull the wings of the ilia outwards, backwards and downwards, and hence the wings of the ilia, besides being smaller, are more

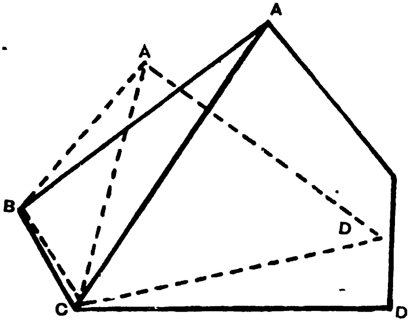

Fig. 64.—Rickety Flat Pelvis.

A B, True conjugate; A C, diagonal conjugate; C D, antero-posterior diameter at outlet; black line, normal pelvis; dotted line, contracted pelvis.

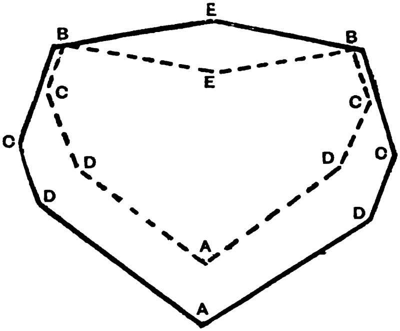

Fig. 65.—Diagram of Brim of Small Flat Rickety Pelvis.

B B, Sacrum; E, centre of sacrum in plane of brim; C C, transverse diameter; D D, ilio-pectineal eminences; A, symphysis pubis; continuous line, normal pelvis; dotted line, contracted pelvis.

inclined than normal to the horizon, and more open anteriorly, while their fossæ look more upwards and forwards, and less inwards, than they should do. The iliac crests are short, and do not curve inwards at their anterior ends as much as in normal pelves, and often do not curve inwards at all, so that the measurement between the anterior superior iliac spines is nearly or quite as great as the diameter between any part of the crests. The obturator muscles pull outwards the ischia, and hence the pubic arch is widened and the ischia are everted.

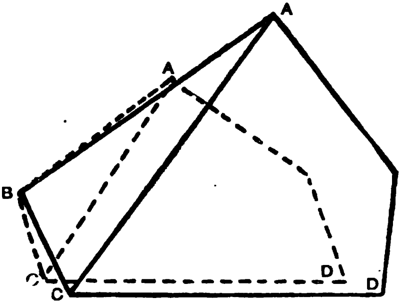

Fig. 66.—Diagram of Pelvic Cavity in Small Flat Rickety Pelvis.

Continuous line, normal pelvis; dotted line, contracted pelvis: A B, true conjugate; A C, diagonal conjugate; D C, antero-posterior diameter of outlet.

(3) There is thickening of the epiphyses. The pubic symphysis is thickened, so that where the two pubic bones meet you have a swelling instead of a depression. The lines of junction between the sacral vertebræ are also thickened.

The history is of no value in the diagnosis of past *rickets*. You may be told that the patient was late in walking. But often the patient will know nothing about this, or may tell you that she walked at the proper time. And even if you can find out that the patient was rickety in childhood, the effects of rickets on the pelvis are so various (depending on the duration of the disease and other influences), that you have not gained information of much value for the management of labour.

Rickets may be present without stunting of growth. Then we have the flat rickety pelvis (Fig. 63).

The shape of this pelvis is almost the same as that of the flat pelvis, but the deformity is greater. There is more inclination of the sacrum, owing to lordosis of the spine. The transverse diameter may be slightly increased, from the femora pressing the acetabula up and out. Apart from the degree of the deformity, the rickety flat pelvis is distinguished from the non-rickety flat pelvis only by the rickety changes in the bones, the thickening of the epiphyses, the diminished concavity or even convexity of the sacrum from side to side. Flattening of the pelvis of a high degree is usually rickety.

CHAPTER XIII.

THE RESULTS OF CONTRACTED PELVIS.

In this chapter I propose to state broadly the effects of contraction of the pelvis, taking all varieties together. In a subsequent chapter I shall describe more in detail the mechanism of the common kinds. Although these effects may result from any kind of pelvic contraction, yet our knowledge of them and of the mechanism is derived from observation of the common kinds; and, therefore, a description of these effects comes appropriately here.*

Retroversion and incarceration of the gravid uterus.—The flat pelvis brings with it an increased liability to incarceration of the retroverted gravid uterus. If the body of the uterus falls down into the hollow of the sacrum, the projecting promontory of a flat pelvis will much more oppose its rising up than a sacrum whose promontory occupies the natural position. Hence in patients with flat pelvis, retroversion with incarceration of the gravid uterus, with the troubles resulting therefrom—retention of urine and its consequences—is sometimes seen repeated in pregnancy after pregnancy.

Abnormal mobility of uterus and child.—When the pelvis and child are each of average size, the lower end of the fœtal ovoid—which is usually the head—sinks during the last weeks of pregnancy into the pelvis. When this has happened, the mobility of the child is restricted; for if the head is engaged in the brim, the movements of the child must be very vigorous indeed to get it out. The fixation of the presenting end of the child in the brim restricts not only the movements of the child, but also the ease with which external agencies—such as coughing, straining, the pressure of garments, and position—can move the uterus. When the pelvis is contracted at the brim, the head cannot easily enter the brim, and therefore does not become fixed in the pelvis. Hence there is greater freedom of movement of the child up to the end of pregnancy, and greater mobility of the uterus, making lateral obliquity and pendulous belly more frequent in pregnancy with contracted pelvis than with normal pelvis.

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* Much of the knowledge contained in this and the following chapters is derived from the great work of Litzmann—*Die Geburt bei engem Becken.* Many of his observations I have confirmed by my own, and I therefore accept those which I have not been able to test.

Pendulous belly.—Some forms of contracted pelvis result from influences affecting the growth of the whole skeleton, producing shortness of stature and even curvature of the spine, and thus lessening the space within the abdomen; and this want of room, added to the increased mobility of the uterus, leads often to the displacement of the uterus forwards, known as pendulous belly (Fig. 67). This displacement of the uterus is more apt to occur in later pregnancies than in earlier, because in the later previous distension has stretched the muscular wall of the belly and made it looser and weaker.

Malpresentations.—The greater mobility of the fœtus, and failure of the head to get engaged in the brim, make malpresentations very apt to occur in contracted pelvis. Thus prolapse of the cord, and of the hand, have been estimated to occur from four to six times oftener, and face, shoulder, and pelvic presentations occur two or three times oftener with contracted than with normal pelvis. When the pelvic end presents, foot presentation is with flat pelvis more common than breech presentation, while with normal pelvis the reverse is the case.

Frequent change of presentation.—From the greater mobility of the child result not only abnormal presentations, but more frequent changes in the part which presents than is usual with normal pelvis. The presenting part often changes during pregnancy. The occurrence of frequent change in the presenting part is favoured by weakness of the uterus, and weakness and looseness of the abdominal walls. In first pregnancies the firm contractions of the uterus, and the resistance of the abdominal walls, help to keep in relation with the pelvic brim a part that has once become partly engaged in it. The uterus and abdominal walls are less powerful in later pregnancies, and hence abnormal presentations and frequent changes in the presenting part are more common in later pregnancies than in the first. A very little mechanical obstruction, easily overcome by the pains when labour has begun, will prevent the head from engaging in the brim during pregnancy.

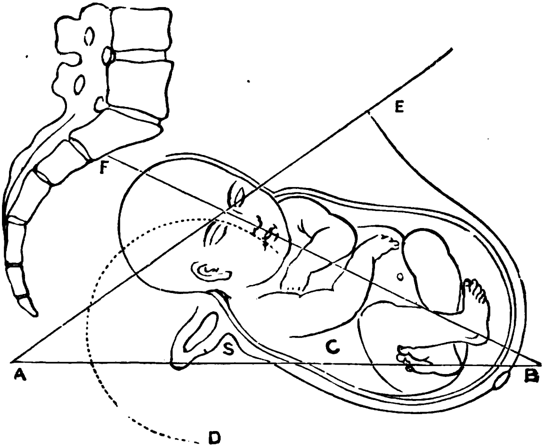

Fig. 67.—Showing what is meant by "Pendulous Belly." (*After R. Barnes.*)

AE, Normal axis of uterus and child; BF, axis of uterus and child with pendulous belly; S, symphysis pubis; OD, line indicating path of fœtal head round pubes.

Effect on the pains.—Contraction of the pelvis does not bring with it any special tendency either to very strong or very weak pains. The strength or weakness, quickness or slowness, of uterine action depends upon conditions of the nerves and muscular fibre of the uterus, which we do not understand. But the ill effects which follow either excessive strength and frequency, or weakness and infrequency, of pains are much greater in contracted pelvis than with a normal pelvis.

How to judge as to uterine action.—It is not possible to judge of the strength of pains, without watching the patient for some time. One pain is not exactly like those that precede and follow it; weak pains alternate with strong ones. We have no means that can be applied in practice of judging as to the absolute strength of pains. The only real practical test of the effectiveness of pains is the amount of advance in the presenting part that they produce.

Effects of weak pains.—The head may be of such size that it cannot *easily* enter the brim, but can be brought through it by a little moulding. If the pains are strong, the head will be driven into the brim, and the child will be born naturally. If the pains are weak, the head will not be driven into the brim. After the membranes have ruptured, the liquor amnii drains away; the uterus becomes contracted round the child, and the cord is pressed on, and the child may die. The labour is so long that the mother suffers from exhaustion.

Effect of very strong pains.—If the pains are excessively violent, and the degree of disproportion between the head and the pelvis is so great that the head cannot enter the pelvis, then retraction of the body of the uterus, and stretching and thinning of the cervix and lower segment of the uterus, go on very fast, and danger of rupture of the uterus comes on early.

Indirect effects on the pains.—Although there is no direct influence exerted on the pains by pelvic contraction, yet by the obstruction to delivery it offers, contraction of the pelvis comes to affect the pains in the course of labour. The presence of resistance stimulates the uterus to increased action. Prolonged muscular action exhausts nerve force, and therefore after pains have continued long, secondary uterine inertia may come on. If this happen, and the case is let alone, the mother will sleep, and then the pains will recommence, and the stimulus of resistance will make them come on stronger and faster than before. It has been said that in the small round pelvis paralysis of the uterus is apt to take place from pressure on the sacral nerves, but observation has not shown this to happen so often as by the theory it ought to do.

Delay in the first stage of labour. (1) *Before rupture of the membranes.*—In contracted pelvis, owing to the head not coming down into the pelvis, it does not fill the circle of the os uteri, and therefore does not dam off the portion of the liquor amnii which is in front of it from the bulk of the waters behind. Hence the presenting portion of the bag of membranes is exposed to the full intra-uterine pressure. In consequence the membranes bulge much more than in normal labour, forming, when the os is small, a process like the finger of a glove, and they are likely, from the increased pressure on them, to break early. Then follow all the bad effects of premature rupture of membranes.

(2) *After rupture of the membranes.*—Supposing, however, that the membranes are strong, and the pains not too violent, and that therefore the membranes remain entire until the bag of waters has fulfilled its function of stretching open the os uteri, and that at this time the membranes give way or are ruptured, the head cannot come down into the cervix, and so the lips of the os fall together again, hanging down like a thick soft fringe into the vagina. As the head does not fill the cervical canal, it does not prevent the flowing away of the liquor amnii. In a normal labour, while a good deal of liquor amnii comes away when the membranes rupture, yet the head soon comes down into the os uteri, fills it up, and stops

further escape of liquor amnii, so that often a good deal is retained until after the child is born, when it comes away in a gush. Between the pains the fluid drains away gradually, but enough is usually retained to prevent injurious pressure on the uterus or on the child.

In a contracted pelvis the head does not fill the os, the uterus is comparatively soon emptied of liquor amnii, and comes to press injuriously on the fœtus, and to be itself exposed to dangerous pressure. The uterine pressure is exerted more directly and more powerfully on the fœtus. If the disproportion is not very great, the uterus may drive the fœtal head through the brim, and then it will come into the cervical canal, which will quickly yield and be stretched open by the head. But if it does not enter the pelvis, the cervix uteri is nipped between the head and the brim of the pelvis, and from this injury follows.

Injuries to the cervix and vagina in contracted pelvis.—Such nipping as has been described hinders the return of blood from the part below the seat of pressure. Hence the cervix below the head gets swollen and œdematous. This is especially marked if the cervix has been in former labours torn into lobes. I have been called to a case in which one lobe of the cervix uteri, thus caught between the head and the pelvic brim, was so swollen that the medical man took it for a tumour. Such great swelling is an indication of the need for delivery. If the patient be soon delivered, the swelling quickly subsides afterwards. If the patient be not quickly delivered, there will be hæmorrhage into the tissues, and finally such destruction of tissue as to lead to sloughing. This sloughing affects first the tissues nearest the fœtus. In the worst cases the whole thickness of the tissues nipped between the head and the pelvic brim is destroyed: part of uterus or vagina, or both, and base of bladder; and thus a vesical fistula is produced. If the *cervix* is held down till the tissues are killed, a utero-vesical fistula is formed. Usually, the prolonged action of the uterus pulls up the cervix, leaving the most continuous and powerful pressure to be exerted on the *vagina;* vesico-vaginal fistula is therefore the more common result.

The opening in the bladder is usually formed some days after delivery, when the mass of tissue killed by the pressure has been separated by suppuration round it, or has softened and given way to the pressure of the urine.

Such injuries as these are usually produced by the mutual pressure of the fœtal *head* and the pelvic brim. The breech is too soft to do much damage; so is the shoulder. The forms of pelvic deformity that contract the outlet might, if they were given opportunity, produce the same effect; but they are rare, and the delay and its cause are comparatively easy of diagnosis, and therefore we seldom see such injury from detention in the pelvic cavity. At first the most severe pressure is exerted on the symphysis, and therefore the part of the genital passage in front suffers most. The uterus opposite the promontory may also be perforated. But while the slough in front opens an important viscus, that behind only opens a sac of peritoneum which usually contains nothing; and if the patient be kept clean, it is soon closed by adhesive inflammation.

Effects on the child's head.—These are important and interesting, for they show where the head has been most squeezed in its passage through the pelvis. In a difficult case we may, as it were, read the history of the labour written on the child's head.

The effects are the following:—

1. Swelling of the subcutaneous tissue below the place where the head is squeezed.
2. Redness, bruising, and excoriation of the skin at the point of pressure.
3. Deformity of the head.
4. Dinting and fracture of the cranial bones.
5. Hæmorrhage into or on to the brain.

The caput succedaneum.—The return of blood from the presenting part, which after the rupture of the membranes is pressed into the cervix uteri, is hindered in a normal labour by the pressure of the circle of the os. Hence this part becomes swollen, from œdema and ecchymosis. The longer the first stage of labour lasts, the greater will be the œdema and ecchymosis. The œdematous part of the scalp is called the *caput succedaneum.* After full dilatation of the os, the head, if the pelvis be small, is pressed on by the walls of the pelvis, which produces the same effect as the os uteri did; and the caput succedaneum gets still larger. The longer the labour, and the more tightly the head is jammed all round into the pelvic cavity, the greater the caput succedaneum. From the movement of the head there is a little alteration in the situation of the centre of the caput succedaneum during labour. The most marked examples of caput succedaneum are therefore seen in labour with very large children, and with a small round pelvis, because in these cases the head is pressed on all round. In the flat pelvis, on the other hand, the head is squeezed in the diameter which lies in the contracted conjugate, and is pressed on comparatively little at other parts. Hence a larger caput succedaneum than that formed in the first stage of labour is not often seen with a flat pelvis.

Occasionally we may see two distinct swellings, one produced by the pressure of the os uteri, one by that of the pelvic bones. Sometimes by the time the child is born the first caput succedaneum, that formed by the os uteri, has been absorbed, and only some venous congestion and wrinkling of that part of the scalp remains to show where it was.

2. **Pressure marks on the skin.**—These are most often seen where the side of the head has scraped past the sacral promontory, because this is the most projecting part of the brim, and, indeed, of any part of the pelvic canal. In a flat pelvis the head lies so that the parietal bone is opposite the

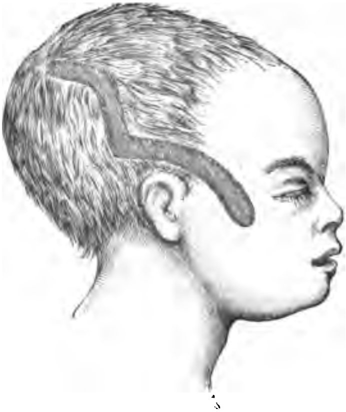

Fig. 68.—Showing Pressure Marks on Head after a Labour with Flat Pelvis. (*After Fritsch.*)

promontory, and therefore these marks are generally over the parietal bone (Fig. 68). If the head is not lying transversely, the frontal or occipital bones may be opposite the promontory and the skin over them may receive pressure marks (Fig. 69). The slightest of these marks consists in redness, either in a round or oval spot, or in a stripe, according to the extent to which the head was altered in shape by squeezing. If the head is hard, and keeps its shape, the effect on the skin is confined to a spot marking the end of the largest diameter which passed the brim. If the head is soft, so that it moulds, and its sides become flattened, then, as it moves along the promontory, a red stripe is left along the path of the promontory. Hard and long-continued pressure produces not

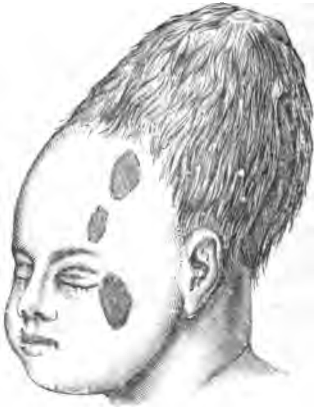

Fig. 69.—Showing Pressure Marks on Head after a Labour with Small Round Pelvis. (*After Küstner.*

merely redness, but ecchymosis. In very protracted labours the skin may be killed where it is pressed on; it looks not red or blue, but white, surrounded with a red or blue margin of congestion or ecchymosis; and the white part, if the child survives, sloughs. Such damage results not necessarily from great pressure, but from long pressure. Fatal pyæmia, having its origin in such sloughing, has been known; but by antiseptic precautions this ought to be prevented. When the nipping of the head is extensive, the parts not pressed on may become slightly œdematous, and this œdema is most evident in the eyelids, because here the connective tissue is looser, and the appearance more conspicuous.

3. **Deformity of the head.**—The head is squeezed so that those diameters that pass through the contracted parts of the pelvis are made smaller. The results of this moulding demand attention.

Over-riding of the sutures.—First, the bones at the sutures over-ride one another. This is very common, and happens in normal labour merely from the resistance of the soft parts to being stretched open; but when the resistance is from deformity of the bones, over-riding takes place to a greater degree. As from the projection of the promontory the posterior-lying parietal bone is the more pressed on, the edge of the posterior parietal bone is pushed underneath the anterior. In exceptional cases the same thing may occur at the frontal suture; and the edge of the squamous part of the temporal bone may be pushed under the parietal bone. These are the sutures at which the bones over-ride one another in flat pelves. If the pelvis is contracted in other diameters than the conjugate, the chief pressure may be on the frontal and occipital bones, and the edges of these bones may be forced under the parietal bones at the coronal and lambdoid sutures respectively. After delivery the difference in the level of the bones at the sutures gradually becomes effaced, and is usually gone within twenty-four or forty-eight hours after delivery. The kind of over-riding shows where the head was most pressed on, and therefore gives useful information about the situation of the chief hindrance to its progress. Great over-riding brings risk of laceration of veins and sinuses, and intra-cranial hæmorrhage; and intra-cranial hæmorrhage is one of the chief causes of death of the child during delivery.

Lateral asymmetry.—There is another kind of displacement at the sutures which occurs in labour with contracted pelvis: that is, a displacement in the sagittal plane of the right and left halves of the cranium. It results from the projection of, and the greater resistance offered by, the promontory. Thus in a small round pelvis, in which the head enters extremely flexed, with the occiput in advance, the resistance of the promontory will, if the labour be difficult, press forwards the half of the head which lay posterior in front of the half which lay anterior. In the flat pelvis, on the other hand, in which the head enters with the forehead low down, and the bitemporal diameter in the conjugate, the parietal eminence, and therefore the half of the cranium which lay posterior, will be pressed backwards. This description holds good of most cases, but there are exceptions. An asymmetrical shape of the head is thus produced.

Flattening of one side of the skull.—In a labour with flat pelvis the side of the cranial vault, which lies behind, becomes flattened, and the side which is in front becomes more arched. As the parietal bone is the one most pressed against the promontory, the flattening is most marked in this bone. Owing to this flattening the distance between one parietal eminence and the opposite ear may be as much as half an inch greater than the corresponding measurement on the opposite side. The arching is due to an increase in the curve of the parietal bone, as if its sagittal and its temporal borders had been pressed together. In the small round pelvis the flattening chiefly affects the frontal bone. No harm to the child results from this flattening of the fœtal head *per se*; but it is often accompanied with intra-cranial hæmorrhages. If the child live, its head will gradually regain its natural shape.

4. **Dinting of the bones.**—This is not a common effect, but it is important, because these dints, even more clearly than the bruising of the skin of the head, show where the head has fitted tightly in its passage through the pelvis. The dints are almost always made by the promontory of the sacrum. The most common kind is a *groove* on that parietal bone which lay behind, running parallel with its anterior border. The formation of a groove like this depends more upon softness of the bones than upon length of the labour. It shows us how the head has come through the brim, but does not tell us much as to the amount of mechanical difficulty. The child is not any the worse for the groove in its skull, which gradually disappears as the child grows. There is a less common mark, viz. a deep spoon-shaped *dint*. The usual place for this is on the parietal bone, in front of the protuberance. It also occurs chiefly when the fœtal head is soft. A deep dint is often accompanied by hæmorrhage between the pericranium and the bone. If the child survive, the dint is slowly effaced. A dint like this may be produced by a forceps blade, if the pull is violent and the head not well seized, but held between the tips of the blades instead of between the fenestræ. A dint may be produced by the promontory while the head is being dragged through with forceps, and such a dint may be in some other part of the head than that which has been mentioned as the usual one, the precise spot depending upon the position of the head when it was seized with the forceps. Lastly, the pressure may do more than dint the parietal bone: it may fracture it. This is rare.

Injuries in head last delivery.—When the after-coming head is dragged through a contracted brim base first it may be dinted as when driven through head first (Fig. 70). But there are certain other injuries to which the head is not liable when it comes in advance. The squamous part of the temporal bone may be driven underneath the parietal bone. The squamous suture or the lambdoid suture may be torn through. The dinting of the parietal bone is mostly on its eminence. The two parietal bones are pressed together, so that they meet at a more acute angle than in the natural shape of the head (Fig. 71). (This may happen if the head comes first, and, which in the flat pelvis is rare, enters without any obliquity at all.) The basilar portion of the occipital bone may be torn from the squamous portion.

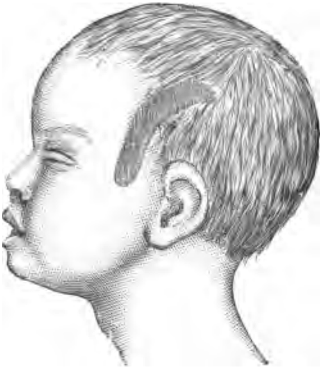

Fig. 70.—Showing Mark made by Promontory in Delivery of the after-coming Head. (*After Küstner.*)

5. **Hæmorrhage into, or on to, the brain.**—This has already been referred to, and its production explained. It is the common cause of stillbirth after difficult or instrumental delivery. The hæmorrhage is usually into the meninges at the base of the brain; less often over the hemispheres, or into the ventricles: very rarely into the brain substance.*

Dangers to the mother.—Contracted pelvis brings with it a greater risk of maternal illness and death after

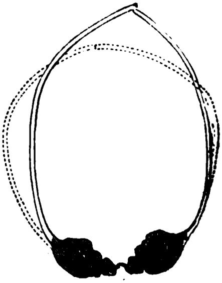

Fig. 71.—Showing Change in Shape of Head produced by Traction with Base in advance. (*After Galabin.*)

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* See Spencer, Obst. Trans., vol. xxxiii.

labour. The great cause of illness and death is *wrong diagnosis*, or rather *diagnosis* not made till *too late*, that is, not before damage has been done by protracted labour, or by futile efforts at dragging the child's head through a pelvis which could not possibly admit it. The use of antiseptics has made obstetric operations, like all surgical operations, far less dangerous than they used to be; but it does not remove all danger in contracted pelvis. The essential thing is to recognise the shape of the pelvis *early*, so that the patient may be delivered in the way proper for the case. Hence statistics show, what at first is surprising, that in lying-in hospitals and maternity charities better results have been obtained in cases where the pelvic contraction has been considerable than in those where it has been slight. This is because the bad cases are easily diagnosed, and the proper treatment is used early; the slight cases are often overlooked till much damage has been done by improper treatment.

The modes in which illness and death may follow are the following. The usual premature escape of liquor amnii leads to continuous pressure by the projecting parts of the fœtus on spots of the uterine wall, and at these parts the uterine wall is apt to get softened and inflamed. The cervix being deprived of its proper dilator is apt to be imperfectly dilated, and the forcible completion of dilatation by dragging the head through it may tear the cervix. The premature rupture of membranes makes the first stage in any case long. The second stage is prolonged because the uterus has to overcome bony obstruction as well as to stretch open the soft parts. Labour with contracted pelvis, like labour with normal pelvis, is more dangerous with first children than with subsequent ones, because conditions causing difficulty are more likely to be overlooked when the guidance is wanting which the history of previous labour gives. In contracted as in normal pelvis, labour is more dangerous with male than with female children, because the heads of male children are on the average bigger than those of female children. Labour is more dangerous when the child is born still or dead than when it is born alive, because the pressure which kills the child also damages the mother. Labours terminated artificially show a larger mortality than those ended naturally, because the former are the worst cases.

Great prolongation of labour is an evil. It means great muscular effort, protracted pain, long abstinence from food, and deprivation of sleep. Besides these injurious influences, there is in contracted pelvis not only stretching and tearing open of the soft parts, but bruising of them by compression.

Greater liability to post-partum hæmorrhage.—The great strain upon the uterus in forcing the child through a contracted pelvis leads to greater liability to exhaustion of its contractile and retractile power; and this after delivery means post-partum hæmorrhage. If the patient be very much exhausted, either from hæmorrhage (or, more rarely, without much loss of blood), she may die from shock some hours after delivery, and after complete cessation of bleeding.

Greater liability to puerperal fevers.—In labour with a pelvis of not less than average size and a child of not more than average size, there can be no destructive compression of soft parts between the fœtal head and the pelvic bones. As a result of the bruising, crushing, tearing, and sloughing of the soft parts which, in labour with contracted pelvis, the pressure of the head on the pelvic bones produces, there follows a greater proneness to inflammation, not only at the injured spots, but of the vagina and uterus, and this may extend to the peritoneum and cellular tissue adjoining. The presence of islands of dead tissue, which have to be separated and discharged; of lacerations; of vaginitis and endometritis; leads to more discharge, and therefore a greater liability to retention of discharge in the genital passage.

Retained discharges are the most fertile soil for the multiplication, and possibly, also, the modification in successive generations, of microbes. Hence a greater liability to sapræmia and septicæmia after labour with contracted pelvis. Inflammation may extend to the veins, and phlebitis may lead to pyæmia.

A patient with contracted pelvis incurs risk of these consequences, even if delivery is effected through the natural passage. It is hardly necessary to say that if the contraction is of such a degree as to prevent the child from passing through the pelvis, much greater dangers are inevitable.

If labour is allowed to go on without interference, the uterus passes into tonic contraction; and then either the mother dies undelivered, or rupture of the uterus or vagina takes place. These effects are not peculiar to contracted pelvis, and are described in chapters XI. and XX.

CHAPTER XIV.

THE DIAGNOSIS OF PELVIC CONTRACTION.

This can only be made by measurement of the pelvis. But you may get information from the history, which, although of no value for diagnosis, should make you suspect pelvic contraction, and measure the pelvis.

Value of the history.—The known causes of pelvic contraction are

Rickets.
Osteomalacia.
Inflammation of bones.
Injuries.

The history is of no value in the diagnosis of past *rickets*, as has been mentioned in describing the rickety pelvis.

Osteomalacia is a very rare disease in England, but endemic in certain localities abroad. The bones of the extremities are so bent, that, with the history that this bending is recent, there cannot be much difficulty in the diagnosis.

Inflammatory disease either of the hip joint, the sacro-iliac joint, or the spine, will be accompanied with deformity of the trunk or limbs that can hardly fail to attract attention.

Fractures of the pelvic bones are among the rarest causes of pelvic deformity; because smashes of the pelvis so extensive as to alter its measurements are usually accompanied with fatal damage to the soft parts.

But while there are no facts about the history from which you can infer the size and shape of the pelvis, even if you can suspect the existence of deformity, in many cases of pelvic contraction you will get no history of disease of any kind. The early history, therefore, may be an indication of the need of examination, nothing more; and it does not always give even this help.

Value of the obstetric history.—More direct hints may be gained from the *obstetric history* of the patient, if she have had children before. But this only gives materials for a very rough guess; for the ease or difficulty of labour depends upon a great many things besides the size and shape of the pelvis. For instance, the size of the child; the degree of ossification of its head; the amount of liquor amnii, and the time at which the membranes rupture; the strength of the pains; the position of the child. In the same patient, from different combinations of these different factors, one labour may be very easy and another very difficult.

The configuration of the body.—Except in the case of dwarfs or deformed persons, no conclusion as to the shape of the pelvis can be got from the general configuration of the body, whether the patient be tall or short, robust or feeble. Deformities of the spine and of the lower limbs make us suspect the presence of the pelvic changes which usually go with them; although even here the amount of pelvic deformity depends upon the age at which the disease began.

The only certain information about the size and shape of the pelvis is that gained by *pelvic examination and measurement.*

Pelvimetry.—There are two kinds or degrees of pelvimetry, which I will call complete and practical.

Complete pelvimetry means the measurement of the pelvis in all its dimensions as precisely as is possible during the patient's life. This takes a long time. It needs much exposure of the patient, and much manipulation which is very disagreeable to her. It is very difficult to take all the measurements accurately. For these reasons such measurement is not submitted to in English private practice, and very seldom attempted in hospital practice. Still, if such measurement enabled us to manage labour very much better, it would be our duty to advise our patients to submit to the unpleasantness, and to let us measure the pelvis with the greatest attainable accuracy. But a very minute determination of the size and shape of the pelvis does not, in the present state of our knowledge, help us more in the management of labour than the determination of a few simple points. This is because the mechanical difficulty of labour depends not only on the size of the pelvis, but on the size and hardness of the head. We have no way of exactly measuring the size of the head. We can tell a large head from a small one, and that is all. We cannot judge at all, before delivery, as to how compressible the head is. While we are ignorant on these points, we do not gain much by knowing the size of the pelvis more exactly than to within a quarter of an inch of the truth.

Practical pelvimetry.—By practical pelvimetry I mean the taking of the few simple measurements which in the present state of knowledge are enough to guide us in practice.

The pelvis can be measured more easily and more exactly immediately after delivery than at any other time. Hence, immediately after any difficult labour, the pelvis ought to be measured, in order that the patient may be rightly advised and treated in subsequent pregnancies and labours. If she has been anæsthetised, measure the pelvis before the patient recovers from the anæsthetic.

When a patient has had a very difficult labour, and finds herself pregnant again, she sometimes goes to a doctor to find out what had better be done. It is in these circumstances that pelvimetry is at present most often called for.

A patient pregnant for the first time very seldom goes to her doctor early in pregnancy that he may find out whether any difficulty is to be anticipated in delivery at term, and take the necessary steps to obviate it. Yet this is the wisest course that a pregnant woman can take. If it were always followed, many labours that are now difficult might be made easy.

Measurements.—The measurements taken are external and internal. The external measurements are

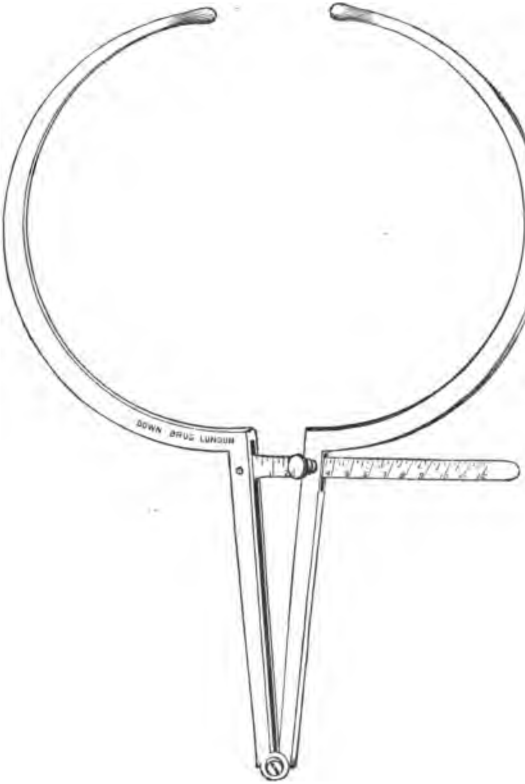

Fig. 72.—Duncan's Callipers.

taken with callipers. The best callipers for the purpose are those sold as Matthews Duncan's (Fig. 72).

A. EXTERNAL MEASUREMENTS.

1. **The transverse measurements of the false pelvis.**—There are two of these :—

(α) The *intercristal.*—This is taken between the iliac crests at the widest part. Put the points of the callipers outside the iliac crests ; press them together, and move them backwards and forwards, noting the place at which they are most widely separated. Measure the distance at this point.

(β) The *interspinous.*—Put the points of the callipers on the anterior superior iliac spines. Press the thumbs against the inner surface of each spine, so that the point of the callipers shall not move inwards beyond the spine.

Another mode, which I think more liable to error, is to put the points of the callipers outside the iliac crests, and move them forwards until you judge they have reached the anterior end of the crests—that is, the external surface of the spines. This is the method practised in Germany. I think it less accurate, because the measurement may be made half an inch more or less, according to where the operator thinks the anterior surface of the spine ends and the external begins.

I find the average intercristal measurement in English women is 11¼ inches; the interspinous, according to the method first given, 10 inches. According to the second method it would be 10½ inches or rather more.

These measurements are easily taken, but are of little service. In different subjects in whom the true pelvis is of full average size, these transverse measurements may differ widely: the intercristal may be as little as 10, or as much as 14 inches ; the interspinous as little as 9, or as much as 13 inches. Hence, unless the transverse measurements are very small indeed, no inference can be drawn from them as to the size of the true pelvis. Taken in relation to the other measurements they sometimes help us in judging of the shape of the pelvis.

In extreme rickety flattening of the pelvis the shape of the iliac crests is altered, so that their anterior ends do not curve inwards as in a normal pelvis. Small variations in the curve of the crests are found in normal pelves; so that a variation from the average amount of incurving so slight that it requires measurement to detect it, is of no importance. An alteration, so great that the spines are as far apart as the crests, can be perceived without measurement, by feeling the crests; and nothing less than this warrants an inference as to the shape of the true pelvis. The deformities of the true pelvis that deform to this extent the false pelvis are easily identified without external measurements.

2. **The external conjugate.**—This is measured from the depression below the last lumbar vertebral spine to the most distant point of the anterior surface of the symphysis pubis. Put one point of the callipers below the spine, let an assistant hold it there, while you move the other limb of the callipers up and down over the anterior surface of the symphysis pubis. When you have found the point that separates most widely the limbs of the callipers, take the measurement. You may have a little difficulty in finding the depression below the last lumbar spine. Take a horizontal line between the highest points of the iliac crests. The last lumbar spine lies about three fingers' breadths below this; and it is about an inch above the line joining the posterior superior iliac spines.

The external conjugate measures on an average about 7½ inches. If the patient be very fat, it may measure more, and yet the true conjugate not exceed the normal. If the bones are slender, and the patient thin, it may be as little as 7 inches, and yet the pelvic cavity of normal capacity. If the external conjugate is less than 7 inches, it is certain that the antero-posterior diameter of the pelvic cavity is less than it ought to be; but the size of the external conjugate does not tell us how much the internal conjugate is shortened. If the external conjugate is more than 7 inches, it does not follow that the pelvis is not contracted. This measurement is therefore sometimes useful, although its utility is small.

It is known as the *diameter of Baudelocque.* This eminent French obstetrician supposed that by deducting from it 3 inches in thin women, and 3¼ inches in the well nourished, the true conjugate might be got. This has been shown to be erroneous. Michaelis found that in living subjects the difference between the external and internal conjugates varied from $2\frac{10}{12}$ to $4\frac{7}{12}$ inches.

The posterior interspinous measurement.—This is taken between the posterior superior iliac spines. Let the patient lie on her face. Trace the iliac crests backwards. The posterior half of the crests runs backwards, inwards, and increasingly downwards. Nearly opposite the fourth lumbar spine the crest runs almost vertically downwards, but still a little inwards. About an inch below the last lumbar spine you will feel the ridge of bone suddenly bend outwards. At this bend there is a slight thickening of the bone, which is the posterior superior iliac spine.

These spines are easily felt in thin patients, but in fat ones it is very difficult, and it may be impossible, to make them out. In most patients there is enough fat over them to make it difficult to be sure that the callipers are accurately applied. Therefore, unless the patient be so thin that the bony points are plainly visible through the skin, the best way of measuring accurately is to mark on the skin the internal and lower margin of each spine. Then, having satisfied yourself that the marks on the skin correspond to the situation of the bone beneath, apply the callipers to the marks.

The chief value of this measurement is its relation to the anterior interspinous. In the normal pelvis it is to the anterior interspinous as 1 to 3, or 1 to 3½. If, as in the small round pelvis, the sacral promontory is high up, the posterior spines are not pulled down and in so much as usual, and the anterior ends of the iliac crests curve inwards a little more, the posterior measurement is larger as compared with the anterior, and the ratio is more than 1 to 3. In the different forms of flattened pelvis, the sacrum being sunk forwards, the posterior spines are dragged down and in to an unusual extent, while the anterior ends of the crests run less inwards. Hence the ratio of the posterior interspinous to the anterior is less: in the extreme forms it may be as little as 1 to 5½.

This measurement is not of much use by itself, nor is the ratio between the measurements. But taken with other measurements it sometimes helps us to determine the kind of pelvis we are dealing with.

Relation of sacral to posterior iliac spines. —At the same time that you take the posterior interspinous measurement, notice another point—viz. whether the posterior sacral spine between the two posterior superior iliac spines is on the same level with them, or sunk below them, or projecting beyond them. In normal pelves it is nearly on the same level; in much flattened pelves it is sunk below them; in pelves of the round type it projects slightly above them. But these statements only apply to the majority and to exceptionally well-marked deformities. In the slighter forms this peculiarity is not marked enough, or constant enough, to trust to for diagnosis. It must be considered with other points.

The transverse diameter of the outlet.—In some forms of contracted pelvis—the kyphotic, the funnel-shaped, and the osteomalacic—this measurement is important. If the patient is not in labour it had better be made externally. The tubera ischii are covered with such a thickness of soft tissue that it is difficult to apply callipers correctly over the bones. Put the patient on her knees and elbows, and then, with the fingers outside, assisted if necessary by a finger in the rectum, map out the outline of the bones, and mark it on the skin covering them. Make sure that your marks correspond to the bones, and then measure between the marks with callipers. The measurement is taken between the two ischial tuberosities, at the point of insertion of the sacro-sciatic ligaments.

Hardie's measurement.—This is a method of measuring the true conjugate externally. It cannot be used after the third month of pregnancy, nor within the fortnight following delivery. It is difficult to do it in nervous women and in fat women. Let the patient's bladder be emptied, and put her on her back, with her legs drawn up. Put your hand on the abdomen, with the tips of the fingers about an inch below the umbilicus. Then by pressing the fingers backwards you will feel the promontory of the sacrum. Having identified the promontory, take a measuring tape; press one end against the promontory, and note the point on the tape which crosses the upper border of the symphysis. Measure the distance between this point and the end pressed against the promontory. This measurement gives a result inexact in two ways: (*a*) the result is shorter than the conjugate by the thickness of the abdominal wall separating the finger from the promontory, and (*b*) it is longer by the extent to which the nearest point of the symphysis to the promontory is nearer than the centre of its upper margin. In women who are not very obese these two errors about balance each other.

B. INTERNAL MEASUREMENTS.

The diagonal conjugate.—The measurement which in most cases is the important one is *the diagonal conjugate.* It is important, because in the common forms of contracted pelvis it is the only one we can take before delivery. From it we can roughly estimate the really important one, the true conjugate.

The diagonal conjugate is measured from the middle of the sacral promontory to the lower edge of the symphysis pubis. The great point in making this measurement is to be sure that the finger is on the promontory. This is recognised by the angle which it makes with the lumbar spine, and by the broad intervertebral substance which separates the body of the last lumbar vertebra from that of the first sacral.

A "false promontory."—In some cases there is what is called a *false promontory*. This means either that the sacral concavity from above downwards is so far obliterated, and the bony union of the first and second piece of the sacrum so imperfect, that the first piece of the sacrum forms with the second an angle opening backwards, and is separated from the second by an intervertebral substance, while it is so convex from side to side that its lateral masses retreat like those of a vertebra. Or it may be that the last lumbar vertebra is so sunk down, and joins the sacrum at so very obtuse an angle that it may be taken for a part of the sacrum. The upper border of the last lumbar vertebra may be actually nearer the symphysis than the lower. Either of these conditions may lead to an incorrect judgment as to the situation of the promontory. A double promontory is, as a rule, only met with in cases of flat pelvis and considerable pelvic deformity. When it is present, we should measure to the upper of the two promontories, and deduct from that to get the true conjugate. The presence of a double promontory is an important point as to the difficulty of labour, because when this is present the resistance to the passage of the head through the brim, instead of being at one point only, is present over the whole breadth of a vertebra.

Inference from the diagonal conjugate as to the true conjugate.—To ascertain exactly the true conjugate from the diagonal conjugate we need to know accurately the height of the symphysis and its inclination to the horizon. If we could ascertain these points precisely, we could construct a triangle, of which we should know the length of two sides, and the angle between them, and therefore the length of the third side could easily be found. The higher the symphysis, and the greater the angle formed between it and the true conjugate, or the less the angle between it and the diagonal conjugate, the greater the difference between the two conjugates.

But in practice, although the height of the symphysis can easily be measured with callipers, the exact inclination of the symphysis, and therefore the angle which it forms either with the true or diagonal conjugate, are difficult to measure. And as there are other factors upon which the difficulty or ease of delivery depends which cannot be recognised with exactness, such precision in the measurement of the conjugate does not at present help us much in the management of a case. A measurement within a quarter of an inch is close enough for practical purposes. Upon the average, the true conjugate is less than the diagonal by about three-fifths of an inch. This average is only widely departed from in cases of great deformity; and in them the recognition that there is great deformity is not difficult.

If the head has not entered the brim, we can measure the true conjugate directly by Johnson's method, which I shall presently describe.

In pelves of natural size there is no practicable way of measuring the transverse diameter. When greatly shortened, the transverse measurements can be taken by Johnson's method.

How to take the diagonal conjugate.—The mode of taking the diagonal conjugate is simple (Fig. 73). Put the index and middle fingers of the left hand into the vagina (the forefinger alone cannot usually reach far enough), and press them up behind the cervix uteri until you feel the sacral promontory. Then, keeping the middle finger on the promontory, press the radial side of the forefinger against the lower edge of the symphysis. Put the nail of the right forefinger beneath the pubic angle, holding it perpendicular to the examining index finger, mark with the nail the point where the index finger touches the lower edge of the symphysis. Now remove the two hands together without separating them. Let someone apply a tape or foot rule, and measure the distance between the tip of the middle finger and the place where the side of the hand touched the lower edge of the symphysis. This distance is the *diagonal conjugate.* It usually measures about three-fifths of an inch more than the true conjugate. Therefore, in most pelves, by deducting half an inch (a more convenient fraction), you get from it the true conjugate. If, when you have pushed the fingers up as far as you

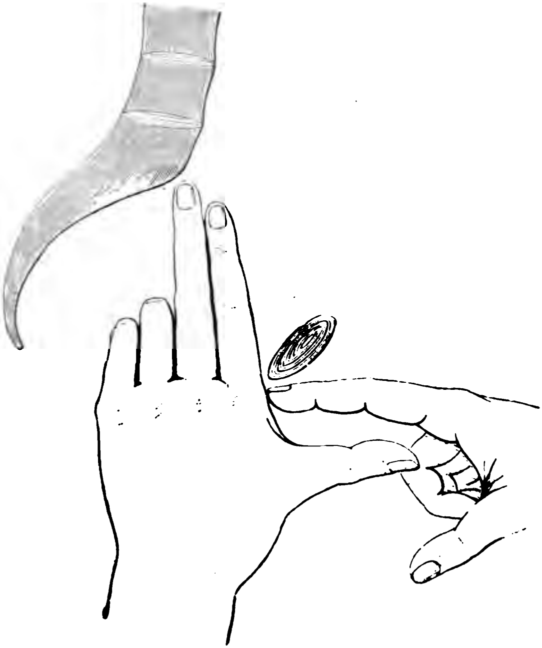

Fig. 73.—Mode of Measuring the diagonal Conjugate.

can without causing pain to the patient, you still cannot feel the promontory, it is probable that the conjugate diameter is not contracted, and certain that it is not much contracted. You can feel the promontory in almost any patient if you press up strongly enough.

In the commonest deformity, viz. slight flattening of the pelvis, this mode of estimating the true conjugate is near the truth, and these are the cases in which it is most important to know the measurement of the conjugate. In the small round pelvis, owing to the high position of the sacrum, the deduction to be made is greater; but here the conjugate is not so important as in the flat pelvis. In the extreme forms of flat pelvis the deduction to be made is sometimes more, sometimes less; but in these cases the measurement can be otherwise made.

Direct measurement of the conjugate.—This can be done after delivery, and, in cases of great deformity, before delivery, by *Johnson's method.*[*]

To measure in this way you must know the measurements of your own hand. The following measurements, which Mr. Johnson gave, are those of a man's hand of average size. Measure your own hand, and see if, and how much, the measurements differ from those here given :—

1. The fingers being bent into the palm, and the thumb extended and applied close to the middle joint of the forefinger, the distance between the end of the thumb and the outside of the middle joint of the little finger is four inches (Fig. 74).

2. In the above position, the distance from the thumb at the root of the nail, in a straight line to the outside of the middle joint of the little finger, is three inches and a half (Fig. 75).

3. The fingers being in the same position, and the thumb laid obliquely along the joints next the nails of

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[*] So called after Mr. Robert Wallace Johnson, who first described it in "A System of Midwifery," London, 1769.

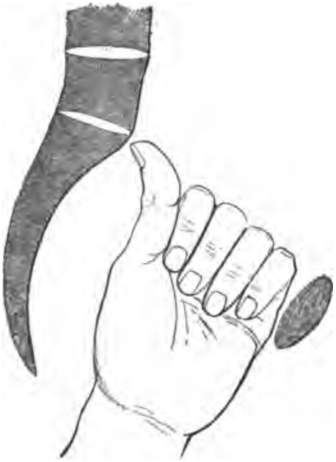

Fig. 74.—Direct Pelvimetry: measurement, four inches.

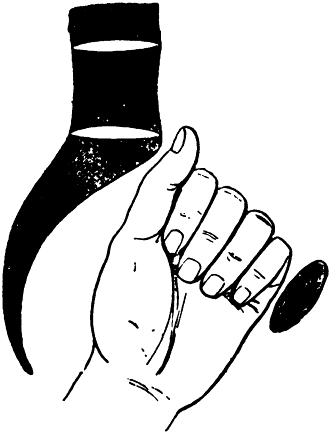

Fig. 75.—Direct Pelvimetry: measurement, three inches and a half.

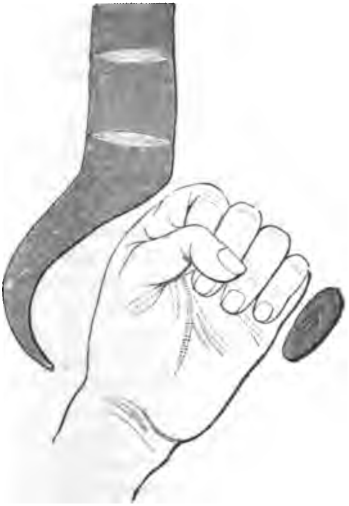

Fig. 76.—Direct Pelvimetry: measurement, three inches and a quarter.

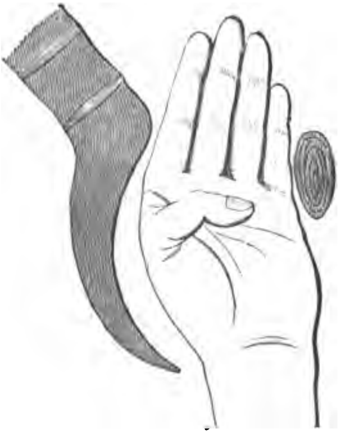

Fig. 77.—Direct Pelvimetry: measurement, three inches.

the first two fingers and bent down upon them, the distance between the outside of the middle joint of the forefinger and the outside of that of the little finger is three inches and a quarter (Fig. 76).

4. The hand being opened, and the fingers held straight, the whole breadth from the middle joint of the forefinger to the last joint of the little finger is three inches (Fig. 77).

5. The fingers being so far bent as to bring their tips to a straight line, their whole breadth across the joint next to the nails is two inches and a half (Fig. 78).

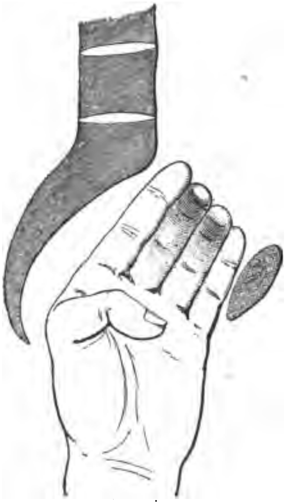

Fig. 78.—Direct Pelvimetry: measurement, two inches and a half.

6. When the first three fingers are thus bent, their breadth across the same joint is two inches.

7. The breadth of the first two, across the nail of the forefinger, is one inch and a quarter.

In any case in which labour has been difficult you ought to measure the conjugate in this way either during or immediately after the third stage of labour. If the pelvis is so contracted that the head cannot enter the brim, you can measure in this way during the first stage of labour. Put your fingers and thumb together in the shape of a cone, and put the whole hand into the vagina and up to the pelvic brim. Then put your hand, in the different positions described, in the conjugate diameter, and see which measurement fills that diameter. Be certain that the part of the hand by which you are taking the measurement is across the narrowest part of the brim, and not lying obliquely to it; for this is the chief source of error in this mode of measurement.

Any other internal diameters of the pelvis that are contracted to four inches or less can be measured in this way with accuracy.

CHAPTER XV.

THE MECHANISM OF LABOUR WITH CONTRACTED PELVIS.

In what cases and why knowledge of the mechanism is important.—The kinds of contracted pelvis that alter the mechanism of labour in ways that have been well ascertained by observation, are the common and slight forms. Descriptions of the mechanism of labour in the rare forms of contracted pelvis are based either on very few cases, or altogether upon theory. In cases of contraction of the pelvis so great as to prevent the birth of a living child, the only mechanism that needs study is the mechanism of dragging out a collapsed or crushed head.

The two commoner and slighter forms of contracted pelvis, viz. the flat and the small round pelvis, affect the mechanism of labour differently. A study of this difference is important, not only because a knowledge of the natural mechanism guides treatment, but because observation of the mechanism helps greatly in the diagnosis of the kind of contracted pelvis with which we are dealing.

1. THE MECHANISM OF LABOUR WITH FLATTENING OF THE PELVIS.

It makes no difference from the point of view of mechanism, whether the flattening is rickety or non-rickety: the mechanism depends on the degree of contraction, not upon its cause. But the rickety pelves are the most contracted.

Effects during pregnancy.—The liability to incarceration of the retroverted gravid uterus in the fourth month of pregnancy, and the greater mobility of the child, have been mentioned. The sinking forward of the sacrum is often accompanied with lordosis of the spine, and this pushes the uterus forward, and helps, together with the greater mobility of the uterus and the child, to make pendulous belly more frequent. Malpresentations—face, brow, breech, footling, oblique positions, prolapse of cord and of hand—are all more frequent with flat pelvis.

Effect on first stage.—The simple flat pelvis seldom offers such great contraction as to prevent the birth of a living child. The deformity hinders the entry of the head into the pelvis. It makes the first stage long, because the membranes often rupture prematurely; and the second stage also tedious, because the long first stage often exhausts the uterus, and because the head often does not pass the brim until some time after full dilatation of the os. But in a simply flat pelvis there is no difficulty from the pelvic bones after the head has passed the brim.

The *diagnosis* ought to be made early, first by finding by abdominal palpation that the greatest diameter of the head is above the brim, and then by measurement of the conjugate.

Transverse position of head.—When the head enters the brim, the sagittal diameter lies transversely. This was noticed by Smellie.* It is because the projecting promontory prevents there being room for the head in either oblique diameter. The projecting promontory throws forward the oblique diameters, so that if the head presents in one of them, the parietal bone which lies opposite the symphysis meets with a resistance which presses it into the transverse diameter. The head passes the brim with its long diameter lying parallel with the transverse diameter of the pelvis, but in front of it (Fig. 79), and if the resistance has been great, the parietal bone lying posteriorly is marked with a dint running parallel with the coronal suture. If the pelvis is not merely flat, but generally contracted, so that in the transverse diameter of the cavity there is not room for the occipito-frontal diameter of the head, then as the head descends it will become more flexed and rotated into the oblique diameter of the pelvic cavity: and the mark on the head caused by the promontory will run from in front of the parietal bone forwards towards the malar bone. But unless there is transverse contraction as well as contraction in the conjugate, the rotation forward of the occiput does not take place till the head has quite passed the brim.

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* N.S.S., Edn., vol. ii. pp. 331, 348 *et seq.*

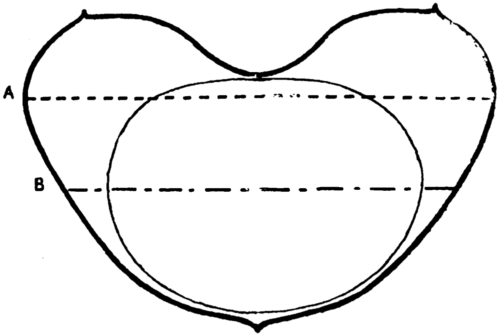

Fig. 79.—Position in which the Head enters the Brim of the Flat Pelvis.
A, Transverse diameter of pelvis; B, diameter in which long diameter of head lies.

Incomplete extension of head.—This *transverse position of the head* is the most constant peculiarity of labour with flat pelvis. The next most frequent alteration of the normal mechanism is, that together with the transverse position of the head, there is sufficient extension to bring the *anterior fontanelle low down.* We find it easily near the middle line, while the posterior fontanelle is high up and reached with difficulty. This is because the greatest transverse diameter of the head (the bi-parietal) is behind, and hence the descent of the hinder part of the head is most hindered. A greater degree of this extension leads to brow or face presentations, which (it has been pointed out in chapter II.), are more common in contracted than in normal pelves. If the delivery take place naturally, the occiput gradually sinks as the head passes the brim; after it has passed the brim the occiput sinks still more; and when it encounters the resistance of the pelvic floor it moves to the front, and delivery takes place as in a normal labour. It will be plain that for the head to enter in this way the transverse diameter of the pelvis must be large enough to admit the occipito-frontal measurement of the fœtal head. A very large transverse diameter will favour the production of a brow presentation, in which the occipito-mental diameter lies across the pelvis. This will be favoured by obliquity of the uterus towards the side to which the abdominal aspect of the child looks, but will not be prevented by obliquity in the opposite direction.

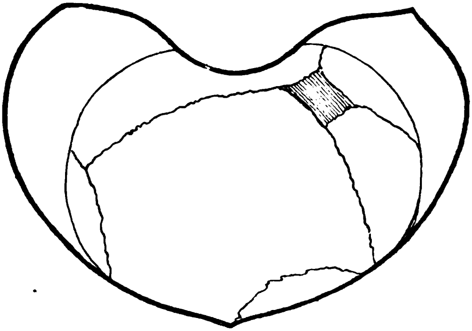

Fig. 80.—Obliquity of Naegele: the sagittal suture near the sacral promontory.

Obliquity of Naegele.—That is, one parietal bone is lower down than the other. This is present in nearly all cases of flat pelvis. In the great majority of cases the anterior parietal bone is the lower, so that the sagittal suture is nearer to the sacral promontory than to the symphysis pubis (Fig. 80). This is because the jutting forward of the promontory hinders the descent of the posterior-lying parietal bone. So regular is this, that it has even been said that the distance between the sagittal suture and the sacral promontory is the best guide to the proportion between the size of the head and that of the pelvis.* This obliquity may reach such a degree that the ear gets behind the symphysis. If the labour ends naturally, the anterior-lying parietal bone becomes fixed against the symphysis pubis, and with this as a centre of rotation the head rotates about its long axis, so that the posterior parietal bone is squeezed past the promontory: and it is bruised and often dinted where the most jutting part of the promontory pressed, the bruises and dints marking its path. While this rotation is taking place the occiput descends; and as soon as the greatest transverse diameter that lies in the brim has got past the promontory the occiput begins to turn to the front. The head may even, in great contraction of the brim, present so much inclined that the parietal bone occupies the conjugate, the sagittal suture being above the promontory. Then, as the posterior parietal bone slips down, a pressure-mark is left beginning at the upper part of the anterior parietal bone, and extending across the sagittal suture, and down the posterior parietal bone, parallel with the coronal suture. The bruising and crushing of the maternal parts opposite the promontory have been described elsewhere.

Posterior parietal obliquity.—The above-described usual and favourable obliquity is called the "*anterior parietal position.*" The opposite, in which the sagittal suture is nearer the symphysis pubis, is called the "*posterior parietal position,*" is unfavourable to delivery, and is much rarer (Fig. 81). Pendulous belly produces anterior parietal obliquity even without contracted pelvis: now pendulous belly is rare in first pregnancies, and therefore the rare posterior parietal obliquity occurs generally in first labours. It is more likely to occur if the promontory is sunk very low, because it then does not so soon arrest the descent of the posterior parietal bone.

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* Litzmann, p. 103.

Posterior parietal obliquity is naturally produced, when bony obstruction is absent, by the fact that the axis of the pregnant uterus lies behind the line of the axis of the pelvic inlet. In easy and premature labours the head often descends into the pelvis in a position of posterior parietal obliquity (Fig. 82). But in a *flat* pelvis the jutting promontory keeps back the posterior parietal bone.

When the head presents in a flat pelvis with this obliquity it passes the brim in the following manner. The pains drive down the anterior parietal bone, and as it descends the posterior-lying parietal bone moves up, and then first the anterior parietal eminence passes the brim, then the posterior. Sometimes the side of the head opposite the promontory remains fixed, and the head rotates round this point as, when it is in the anterior parietal position, it rotates round the symphysis. But this only happens when the fœtal head is small and soft, so that it becomes indented instead of moving up. If the posterior parietal position persists, and is not removed in either of these ways, perforation or turning will be necessary.

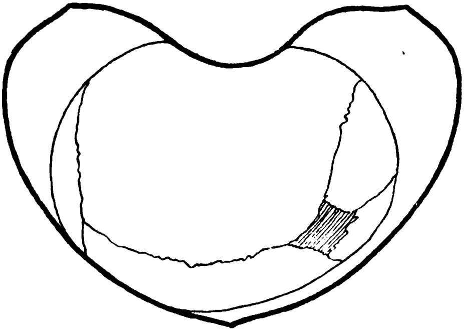

Fig. 81.—Posterior parietal Obliquity: sagittal suture nearer the symphysis pubis than the promontory.

Mechanism with the face presenting.—In flat pelvis face presentation is commoner than in normal pelvis; and in such cases the face lies transversely, the chin towards one side, the forehead to the other. We have no observations of the mechanism of the passage through the brim in such cases. In my own practice I have always anticipated difficulty in such cases by turning. Remember this effect of the flat pelvis, and if you find the face lying transversely suspect flattening of the pelvis.

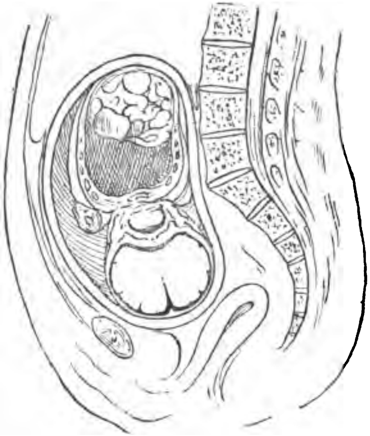

Fig. 82.—Posterior parietal Obliquity in easy Labour with small Child. (*From a frozen section after Pinard and Varnier.*)

Mechanism with the after-coming head.—The after-coming head generally enters the flat pelvis transversely; although, if it be small, it may do so in an oblique diameter. The diameter which lies in the conjugate is a transverse diameter in front of, and smaller than, the bi-parietal, which lies on one side of the sacral promontory. If the conjugate is so small as to offer resistance to the diameter engaged in it, the head becomes partly extended. But when the head moves onwards, the bi-parietal diameter is held back more than the shorter diameter in front of it, and so the head becomes flexed. If the natural mechanism is not interfered with, the advance of the posterior-lying parietal bone is arrested by the sacral promontory, and the side of the head which lies anterior rotates round the promontory. There is thus a close analogy between the modes of passage of the fore-coming and the after-coming head through a flat pelvis. In both cases the head lies transversely; in both the head is at first more extended than with a normal pelvis; in both there is obliquity produced by the holding back of the posterior-lying parietal bone.* The head may be detained above the brim; and in such cases we cannot watch the natural mechanism, because, for the sake of the child's life, prompt delivery is needed. If the head is delivered by jaw traction, and the chin is pulled down while the greatest diameter of the head remains above the brim, then first the bi-temporal and then the bi-parietal diameters pass the conjugate. If the head is delivered by forceps, the head may pass the brim without increased flexion, so that the bi-temporal diameter is the largest that lies in the conjugate. The posterior-lying parietal bone will, if much force is used, be grooved by the jutting promontary, and this groove will show the way in which the head moved. If the body should be delivered with its abdominal surface forwards, the chin may catch on the pubic bone. The difficulty of delivery will be great, and as slow delivery means certain death to the child, if delivery is not quick the perforator should terminate the case.

Effects on the fœtal head.—The caput succedaneum is less marked in this than in the small round pelvis. Circumscribed pressure marks in the skin and dinting of the fœtal skull are commoner, because in the small round pelvis the projection forwards of the promontory is not so great.

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* See Goodall, Transactions of the International Medical Congress, Philadelphia, 1876.

Great overriding of the bones at the sutures is less common in flat pelvis than in the small round pelvis, because in the former the pressure is more localised, and therefore dints the bone instead of depressing the whole bone. Antero-posterior displacement of the two lateral halves of the cranium is more common in flat pelvis. Flattening of the posterior-lying parietal bone is almost always produced, with corresponding arching of the opposite side of the cranial vault. In the slighter forms of contracted pelvis there is a gutter-like depression where the head scraped past the promontory; which in the case of the after-coming head runs from the anterior inferior angle of the parietal bone upwards and backwards to the parietal eminence: in the greater contractions there is a funnel-shaped dint where the head stuck for a time opposite the promontory.

2. THE MECHANISM OF LABOUR WITH THE SMALL ROUND PELVIS.

The broad distinction between the round and the flat pelvis.—The mechanism of labour with the small round pelvis is practically the same as that with a normal pelvis but a too large fœtal head. If the fœtal head is too large, the pelvis may be said to be relatively small. This mechanism is quite different from that with the flat pelvis. The great broad difference is this, that with the flat pelvis the difficulty is at the brim: the head cannot easily *enter* the pelvis. When it has entered the pelvis all mechanical difficulty is over. With the small round pelvis, on the contrary, the head can enter the pelvis, but cannot easily pass *through* it; there is difficulty throughout the whole passage of the head.

During pregnancy.—In the small round pelvis the promontory of the sacrum does not overhang, and therefore there is not the greater liability to incarceration of the retroverted gravid uteris that the flat pelvis brings with it. From the fact just mentioned, that in the small round pelvis the head can engage in the brim, it follows that there is not with the small round pelvis the liability to obliquity of the uterus or to pendulous belly that the flat pelvis brings with it. Nor is there so great a tendency to transverse presentations, or to prolapse of the hand or of the funis. The small size of the pelvis may prevent the occiput from coming down, because the greatest transverse diameter of the head, viz. the bi-parietal, is nearer the occiput than the sinciput. Hence the small round pelvis favours the occurrence of fronto-cotyloid occipito-posterior positions, of brow presentations, and of face presentations.

First stage of labour.—In the small round pelvis, as the head can fill up the pelvic inlet, and its advanced part can press into the os uteri, there is not the tendency to premature rupture of membranes. If the pains are very strong, the head may be so jammed into the pelvis as to nip the cervix all round between it and the pelvic bones, and so prevent its retraction over the head.

Extreme flexion.—In the small round pelvis the oblique diameters are not encroached upon. The head therefore enters the pelvis in one of the oblique diameters. But whereas, in a normal pelvis, the head meets with no resistance from the bones, and the work of labour consists solely in the dilatation of the soft ports, in the small round pelvis the head can only pass by its position being closely adapted to the pelvis. The sub-occipito-frontal diameter measures on the average four inches. Now if the oblique diameter of the pelvis measures, say, four inches and a quarter, and is by the soft parts made still smaller, you will see that the head can only enter it by being extremely flexed, so that the sub-occipito-frontal diameter, and no larger one, shall occupy the brim. If it be not completely flexed, a larger diameter than the sub-occipito-frontal will lie across the pelvis, and entry be impossible. Hence with the small round pelvis there is *extreme flexion* of the head, so that the posterior fontanelle is lower down, and nearer the middle of the pelvis than usual: and this flexion occurs when the head is higher up, because it is produced by the resistance of the pelvic brim, instead of by that of the os uteri, as in normal labour.

Early rotation,—In labour with a normal pelvis the turn of the head into the antero-posterior diameter of the pelvis (internal rotation) does not take place until quite late, often not till the head is distending the perineum. This is because the turn here depends upon the soft parts and not upon the bones. But in the small round pelvis the head cannot get through unless it accommodates itself to the *bones*. Hence the turn forward takes place earlier, because it is produced by the narrowing of the transverse diameter of the pelvis at the outlet, which obliges the long diameter of the head to go into the long diameter of the outlet. This rotation is not only earlier, but more complete. In labour with a normal pelvis and a small child, internal rotation may be incomplete or not take place at all, but the child be born in an oblique diameter. If the pelvis is small and the child large, it must be complete.

Variability of position.—If the fœtal head is not impacted in the pelvis, it advances during each pain, and recedes in the interval. Now if the advance and recession be considerable, the head may during the pain be driven so far down that the occiput is obliged to turn forward; but in the interval it may recede so much that it gets into a part of the pelvis in which there is most room for the long diameter of the head in the oblique diameter. Then the occiput will turn back again as the head recedes. This changeability in the direction of the long diameter of the head is characteristic.

Effect on the soft parts.—When the head is jammed into the cavity of a small round pelvis, it is pressed upon all round, instead of, as in the flat pelvis, only where it is opposed to the sacral promontory and the symphysis pubis. Hence the circulation through the scalp is interfered with at the girdle of pressure, and the part in advance, that is not pressed on, becomes œdematous. In other words, a large caput succedaneum is formed during the second stage of labour. The pressure that produces œdema of the scalp also produces œdema of the maternal soft parts below the seat of pressure. This is chiefly evident in the labia, because they are visible and are formed of loose tissue, so that they can swell, The disturbed circulation hinders the secretion of the vaginal and vulvar glands, and the vagina becomes dry. It feels hot, dry, and swollen.

Absence of Naegele obliquity.—The obliquity of Naegele is characteristic of the *flat* pelvis. In the small round pelvis the obliquity of Naegele is hardly ever found. This is because the sacral promontory does not project so much, and therefore does not hinder the descent of the posterior-lying parietal bone. At the beginning of labour it is common for the posterior parietal bone to be slightly lower down, so that the sagittal suture is rather nearer the pubis than the sacrum. This is always the case if the long axis of the uterus is much behind the line of the axis of the pelvic brim, and there is no hindrance to the entry of the head. If in the small round pelvis the head enters in this position, in the progress of labour the anterior parietal bone descends with much less difficulty than in the flat pelvis. A very great degree of this posterior parietal obliquity is always unfavourable in the small round pelvis, as in the flat pelvis.

Breech presentations.—Breech presentations do not, in the small round pelvis, present greater difficulties than head presentations, unless, by untimely pulling, the arms or head get extended. If this happens, the smaller space in which you have to work will make the task of getting down the arms and pulling down the head more difficult than usual.

Rupture of the uterus is seldom met with from the small round pelvis; partly because great contraction of this form is rare, and partly because the wedging in the pelvis of the head, the swelling of the labia, etc., soon demonstrate the need for assistance.

Effects on head.—The pressure effects on the head consist chiefly of moulding and the great caput succedaneum. Red stripes and ecchymoses are sometimes seen; but dints and furrows in the bones are very rare. The most characteristic local pressure mark is a red stripe caused by the pressure of the promontory, extending from the parietal bone towards the jaw or eye, and produced by the side of the head and face scraping past the promontory as the occiput descends. The head is squeezed so that it is lengthened in its longest diameter. The occiput, being the part first exposed to pressure, is pressed under the parietal bones. The posterior-lying parietal bone is by the pressure of the promontory depressed beneath the anterior. The frontal bone, over which the greatest squeeze is exerted, is pressed beneath the parietal.

To make the difference between these two forms of pelvis clearer, I put the differences in a table.

FLAT PELVIS.	SMALL ROUND PELVIS.
Incarceration of gravid uterus common.	Incarceration of gravid uterus not specially common.
Obliquity of uterus common.	Obliquity of uterus not common.
Pendulous belly common.	Pendulous belly not common.
Transverse presentations and footling presentations common.	Transverse and footling presentations not common.
Premature rupture of membranes common.	Premature rupture of membranes not common.
Head usually lying transverse.	Head usually in oblique diameter.
Posterior position of occiput not specially unfavourable.	Posterior position of occiput very unfavourable.
Brow and face positions common.	Brow and face positions common.
Obliquity of Naegele the rule.	Obliquity of Naegele rare.
Obstruction at brim only.	Obstruction throughout pelvic cavity.
Small caput succedaneum.	Great caput succedaneum.
Little œdema of vagina and vulva.	Great œdema of vagina and vulva.
Dinting of cranial bones common and moulding slight.	Dinting of cranial bones rare; moulding great.

I may complete the contrast by anticipating the contents of the next chapter, and place opposite to one another the different treatment of each form.

FLAT PELVIS.	SMALL ROUND PELVIS.
Turning, *if passages fully dilated,* the best treatment.	Forceps the best treatment. Turning not advantageous.

CHAPTER XVI.

TREATMENT OF LABOUR WITH CONTRACTED PELVIS.

In this chapter, as in the preceding ones, I refer only to the common forms of contracted pelvis: the flat pelvis, the rickety pelvis, and the small round pelvis.

FLATTENED PELVIS.

Classification according to degree of contraction.—From the point of view of treatment, cases of flat, rickety or non-rickety pelvis may be roughly divided into three classes :—

1. Those in which a full-time child cannot pass through the pelvis. This includes all cases in which the obstetrical conjugate is not more than two inches.
2. Those in which a full-time child cannot pass *living* through the pelvis. This includes all cases in which the conjugate is more than two inches, but less than three.
3. Those in which it is possible for a living child to traverse the pelvis; cases in which the obstetric conjugate is at least three inches.

This is only a rough division. It holds good of the majority of cases, but not of all, for the following reasons :—

Why only approximate.—The difficulty of labour depends not simply on the size of the pelvis, but on the size of the child and the degree of ossification of the child's head. The treatment of labour depends also upon the position of the child, the way in which the uterus acts, the time at which the membranes rupture, and other features of the course of labour. Remember also that the pelvis cannot be measured during life with greater exactness than to within a quarter of an inch. Bearing these things in mind, you will see that rules of treatment based on the length of the conjugate must have many exceptions. Still, the size of the pelvis can be ascertained with greater approach to correctness than the size of the child; and we do not go far wrong in assuming that the child is of average size and weight, and that the degree of ossification of its head is also average; for wide deviations from the average are unusual. The events of labour cannot be predicted beforehand. Therefore, the size of the conjugate, although not the sole factor which determines the difficulty of delivery, is yet the surest basis from which to forecast it.

A patient with contracted pelvis may (1) ask your advice during pregnancy, or (2) she may not suspect the deformity, and it may only be discovered when labour has begun at term. Consider first the former case.

Premature labour.—It is better to prevent difficulty than to have to treat it. Difficult labour with contracted pelvis is prevented by inducing premature labour. The greater the contraction the earlier must the uterus be emptied if difficulty is to be avoided.

Alternatives in great contraction.—The child cannot be born and survive before the end of the twenty-eighth week of pregnancy. The head of the child born at the twenty-eighth week of pregnancy cannot pass through a pelvis having a smaller conjugate diameter than two inches and three quarters. Hence in a pelvis so small as this, your choice, or rather that of the patient, lies between the induction of abortion as early as possible, and deliberately allowing the pregnancy to go on to full term in order that the patient may be delivered of a living child by Cæsarian section.

Choice of time for induction in moderate contraction.—If the conjugate diameter be two inches and three quarters, or more, and the transverse diameters of the pelvis not so shortened but that you can perceive the shortening, a living child may be delivered if labour is induced prematurely. The earlier labour is induced the easier will be the labour, and therefore the better for the mother, and the better the prospect of the child being *born* alive: but the greater will be the difficulty of rearing the child. Hence the selection of the date at which labour shall be induced is a compromise between these two difficulties:—(1) that of delivering the child alive, (2) that of rearing it.

Taking the conjugate diameter as the guide, the following are the dates at which labour should be induced in different degrees of deformity:—

Obstetrical	conjugate,	2¾	inches	... 28th	week.
,,	,,	3	,,	... 30th	,,
,,	,,	3¼	,,	... 32nd	,,
,,	,,	3½	,,	... 36th	,,

But do not forget that the pelvis is only one factor: the size of the child is quite as important. The date above given is that at which the patient should be told to be prepared to have labour induced. Tell her to let you examine the abdomen a fortnight before the date assigned. If you find the child's head is above the brim, and is so large that you cannot press it down into the brim, bring on labour at once, without waiting for the prearranged time. If, on the other hand, when the appointed time comes you find that the child is small, and that the head is engaged in the brim, or that you can easily press it into the brim, let the pregnancy go on for another fortnight, and then examine again. If you find that the head is not presenting, alter the position of the child by external manipulation so as to get the head over the brim. If the head is near the top of the uterus and there is so little liquor amnii that you cannot bring it down over the brim, you must be content with getting the breech into the brim and inducing labour at the time pointed out by the size of the pelvis.

The methods of inducing labour are described in chapter xxx.

LABOUR AT TERM.

But you will not always have the opportunity of preventing difficulty. You may not be called till the pregnancy has gone to term and labour has begun.

Importance of pelvimetry and abdominal examination.—The first essential to proper treatment is an early diagnosis of (1) the size of the pelvis, and (2) the size of the child. Not to find out the need for Cæsarian section until the child has been destroyed, the mother's tissues have been bruised and torn and her strength has been exhausted by protracted ineffectual labour and vain attempts to deliver, is a disgrace to the accoucheur in attendance, for such extreme deformity should be recognised at once. It is not quite so discreditable, but still a thing to be ashamed of, only to discover that craniotomy is necessary by the failure of protracted trials of other modes of delivery.

When you are called to a case of labour in which you suspect pelvic contraction, (1) measure the pelvis, (2) observe the effect of the pains, (3) examine the belly to find out (*a*) the size of the child, and (*b*) how far you can press it down with your hands into the pelvic brim.

Cases in which Cæsarian section is necessary.—The question of treatment is simplest in the higher degrees of contraction. An expert operator, with good instruments, can deliver a child at full term through a rickety pelvis of which the conjugate diameter measures two inches. If smaller than this, delivery by the vagina is impossible, and ought not to be attempted. Cæsarian section is the only mode of delivery

The rickety pelvis is practically the only one met with in English practice which presents this high degree of deformity. Osteo-malacia may contract the pelvis even more than rickets: but it is very rare in England, and if the disease is advancing, the bones will be soft, so that the pelvis can be forced open with the hand. The pelvis has been thus opened up so that a living child has been delivered through it. The space may be narrowed as a result of fracture of the pelvic bones, or from tumour; but these are also rare.

Cases for Cæsarian section or craniotomy.—If the conjugate measures above two inches, and the transverse diameters are not greatly shortened, the child can be extracted by craniotomy. If it measures less than three inches, the child cannot be born alive (unless it be very small), and therefore craniotomy should be performed as soon as the os uteri will admit the hand, without injuring the mother by attempts at delivery in other ways. Craniotomy may be required when the conjugate is more than three inches, but in such cases the necessity for it will be revealed in the course of labour.

Craniotomy.—The smaller the pelvis the more difficult is craniotomy. Statistics nevertheless show that fatal results more often follow craniotomy in the lesser degrees of contracted pelvis. This is because in such cases craniotomy is often postponed until serious damage has been done either by leaving the case too long to nature, or by ineffectual attempts at delivery by other means. The mortality of craniotomy skilfully done at the proper time is not greater than that of natural labour.

Cæsarian section *v.* craniotomy.—The mortality of Cæsarian section, done at the proper time, in suitable places, and by skilled operators, has now been reduced to about 5 per cent. Therefore, in cases in which the pelvis will not allow the birth of a living child, you may properly propose Cæsarian section as an alternative to craniotomy. In favour of craniotomy the sole argument is that its danger to the mother is not greater than that of natural labour. Against it is the fact that this risk, or that of abortion, together with all the discomforts of pregnancy, may recur again and again; and that the patient will never have the happiness of motherhood. In favour of Cæsarian section is the almost certain hope of a strong, healthy, living child; and that during the operation the patient can be sterilised, so that the discomforts of pregnancy and the risk of operation will not recur. Against Cæsarian section is its danger to the mother; nothing else. The facts must be put to the mother, who must decide. The conditions on which the danger of Cæsarian section depends are described in chapter XXVIII.

Slighter degrees of contraction.—Assuming that the deformity is not so great as to prevent the passage of a child, *take greater care than usual to prevent premature rupture of the membranes.* They will very likely break too soon. Whether they do or not will depend upon (*a*) their strength and (*b*) the pressure put upon them. Over (*a*) their strength you have no control. But (*b*) you can do something to prevent early rupture by keeping the patient on her side, so that the weight of the liquor amnii may not help the uterine contractions to burst the membranes; by telling the patient to avoid straining; and by being exceedingly careful, in every examination you make, in no way to injure, or increase the tension of, the membranes.

Do all you can to favour the entry of the vertex. With a flat pelvis there is a tendency for the head to present in an unfavourable position—with the face, or the brow. There is also a tendency to displacement of the uterine axis, viz. pendulous belly, or great obliquity of the uterus; and these displacements favour abnormal presentations. You will promote entry of the head in a good position by getting the long axis of the uterus to coincide with that of the pelvic brim. If there be pendulous belly, apply a firm binder while the patient is on her back. If there be great lateral obliquity, bid the patient lie on the side opposite to that towards which the fundus uteri is deviated. If the position of the child is unfavourable, try to correct it by external manipulation.

Watch the pains with greater care than usual. As there may be difficulty, it is most necessary that the patient's nervous energy should be preserved. If the patient presents signs of great fatigue before the time for delivery has come, give opium, so that she may rest.

If the disproportion is so great that natural delivery cannot take place, and help is not given, either the uterus will pass into a state of tonic contraction, and the patient die undelivered; or rupture of the uterus or vagina may take place; or if at length the uterine action succeeds in forcing a full-sized child through a contracted brim, sloughing of the soft tissues may take place. The mechanism of these two latter events needs further consideration.

Nipping in first stage.—The membranes ought not to rupture until the os is big enough to admit the hand. If the membranes rupture prematurely, the head cannot come down into the cervix to dilate it until the uterus has forced a large part of the head past the brim; and if the disproportion be great, it will not come into the cervix at all. If the uterine action is violent, the head, being forced down upon the sacrum and pubis, may so nip the cervix between it and the pelvic bones that the contractions of the longitudinal fibres cannot pull the cervix up. If the labour is allowed to continue without treatment, the continued pressure may kill the tissues compressed, and then after delivery the crushed tissues slough, so that a vesical fistula is the result in front, and a hole in the cervix opening into the peritoneum behind. This latter injury, if septic infection has not taken place, is soon closed by adhesive inflammation.

Nipping in second stage.—But the pains during the first stage of labour may be strong enough to pull open the cervix, and yet not so frequent and prolonged as to nip the cervix strongly enough to

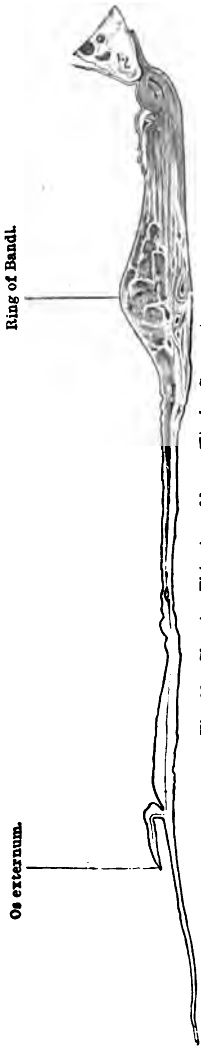

Fig. 83.—Showing Thinning of lower Uterine Segment.

(Drawn by Dr. T. W. P. Lawrence, by permission of Dr. John Williams, from a specimen in the Museum of University College.)

damage it; and if this be the case the cervix will not be injured during its dilatation. Then the pains of the second stage will compress the vagina between the head and the symphysis, and this pressure may kill the part of the vesico-vaginal wall subjected to it, and a vesico-vaginal fistula will result.

Rupture of uterus.—If the pains are very strong and follow each other quickly in the first stage of labour (especially if ergot has been given), the cervix may be nipped and held fast between the head and the pelvis, while the upper part of the uterine body goes on contracting and the lower segment stretching. As the cervix cannot be pulled up, the part of it above the part nipped is stretched immoderately, and may give way, and *rupture of the uterus* takes place (Fig. 83).

Rupture of vagina.—If after the cervix has been pulled up over the head the pains become very strong and frequent, or continuous, from ergot having been given, and the obstruction is insurmountable, then, as the uterus pulls the cervix up, the vagina will be stretched, and thus *rupture of the vagina* may happen.

From pendulous belly.—If pendulous belly is present, the hanging forward of the uterus may so stretch the posterior vaginal wall over the child's head that this may rupture, even though the pains are not vigorous, nor the pelvis so contracted as to prevent the advance of the child. This is an additional reason for correcting this abnormal position of the uterus (Fig. 84).

Prevention.—These accidents ought not to be allowed to happen. If the bag of membranes ruptures prematurely, either (1) the child's head will come down into the cervix and put the rim of the os uteri on the stretch, (2) or it will not. If (1) it does, it may be inferred that the disproportion between the child and the pelvis is not very great, and the labour may be left to take its course.

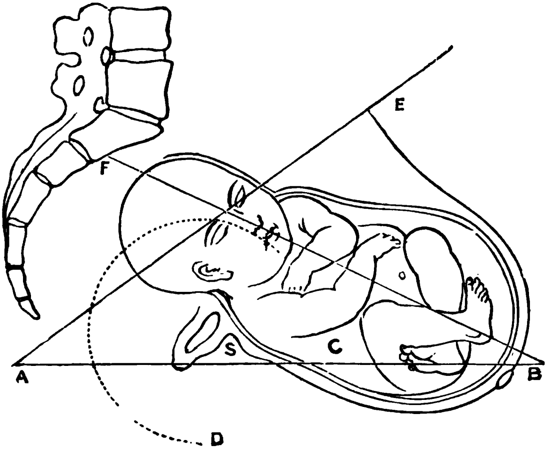

Fig. 84.—Showing what is meant by "Pendulous Belly." (*After R. Barnes.*)

A E, Normal axis of uterus and child; B F, axis of uterus and child with pendulous belly; S, symphysis pubis; O D, line indicating path of fœtal head round pubes.

Artificial dilatation of the cervix.—If (2) the disproportion between the head and the pelvis is so great that the head does not come into the cervix to stretch it open, then the best treatment is to dilate it artificially. The os, though not fully dilated, may be partly, and may be thin, soft, and dilatable. If so, and if the head is engaged in the brim in a good position, the cervix will probably dilate quickly when the head is pulled down into it with forceps. If the os is too small for forceps to be applied, or if the head is not in a good position, or not presenting, then the best treatment will be to replace the bag of membranes by an artificial dilator. The best is the water-bag of Champetier de Ribes. With this the cervix is dilated to the full extent by water pressure alone. (The use of this instrument is described in the chapter on Premature Labour.) I believe that it will be found of great service in these cases; it is possible that further experience may show some drawbacks to its utility, though at present I know of none.

When the cervix is fully dilated the state of things can be made out more closely than before. Measure the pelvis, if you have not already done so, or if you are in doubt as to the correctness of your internal measurements. Examine the abdomen, and if the head present see how far above the pelvic brim its greatest diameter is lying, and how far it can be pressed down into the brim; and ascertain accurately its position. Listen also for the fœtal heart.

Indications for immediate craniotomy.—If you find that the size of the abdomen is consistent with the patient's belief that she has reached term; that the greatest diameter of the head is high above the pelvic inlet, and cannot at all be pressed down into the pelvis; and that the conjugate diameter is less than three inches, perforate at once.

If you are not called to the case until tonic contraction of the uterus has set in, or if ergot has been given, and you find that in spite of continued uterine action the greatest diameter of the head is above the brim, and that on abdominal examination the fœtal heart is not to be heard, then, whatever the degree of narrowing may be, perforate at once.

Indications for forceps.—If the conjugate is three inches or more, the fœtal heart is audible, and uterine contractions are present, examine carefully the position of the head. If it is lying with its long diameter transverse, the anterior fontanelle as low down as the posterior, and the sagittal suture nearer the promontory than the symphysis but not less than three-quarters of an inch from the promontory, you will probably find that the greatest diameter of the head is not high above the brim. The position of the head is here as favourable as it can be, and you will probably find delivery with forceps easy.

Most favourable position of head.—Litzmann pointed out, as an induction from clinical experience, that when the sagittal suture is nearer the promontory than the symphysis, and not less than three-quarters of an inch from the former, forceps delivery was generally easy. Take a fœtal head and a pair of callipers, and place one point about an inch from the sagittal suture, and the other at the opposite end of the diameter of the fœtal head taken through this point; you will find that this subparietal-superparietal diameter is about the smallest that you can get. (The end of the finger is too obtuse to get quite to the point of contact between head and sacrum, so that a sagittal suture apparently distant only three-quarters of an inch from the promontory is really a little farther from it.) The fact that the sagittal suture is in this position is thus proof that the head is entering the brim with the smallest possible diameter opposed to the conjugate. If in such a case you use forceps, you will feel the posterior parietal bone slip rather suddenly past the promontory; and after this has happened delivery will be easy.

Indications for turning.—If, instead of finding the head in this position, you find that it is in (*a*) a face position; (*b*) a brow position; (*c*) that the sagittal suture is nearer the pubes than the promontory; or (*d*) that, although the pelvis is not contracted to a high degree, yet the head is so large that its greatest diameter is high above the brim; or if there be (*e*) prolapse of cord or an extremity; then (the cervix being fully dilated) turn and bring down a foot.

Comparison between forceps and turning.—The choice between forceps and turning, when the head is in a favourable position, depends mainly upon the extent to which the head is engaged in the brim. If it is so far engaged in the brim that its greatest diameter is felt by abdominal examination to be not high above the brim, forceps is indicated. If the greatest diameter is high above the brim you should make it your aim to estimate so accurately the relative size of head and pelvis as to judge early in the case whether craniotomy will be required or not, and not waste time and do damage by vain attempts at the impossible.

For reasons already given one cannot be always certain that delivery with forceps is or is not possible. Extreme cases, in which it is plainly impossible, can and ought to be recognised at once; but in the slighter degrees of contraction you cannot say that forceps delivery is impossible till you have tried. If, the cervix being fully dilated, the head is so high and movable that the indications for forceps are not clear, and yet it is not so large that delivery of the child alive is clearly impossible, turn. Cases in which, from faulty position of the head, there is an evident advantage in turning, also ought to be recognised at once.

Statistical comparisons between the results of forceps and turning are not worth much. Forceps delivery may need hard pulling, but that is the only difficulty about it. On the other hand, to deliver a living child by turning requires considerable skill. The right moment must be chosen, viz. when the passages are dilated, but before the liquor amnii has completely run off; the arms must be quickly brought down, and the head promptly delivered; and promptly means skilfully. Hence an unskilful accoucheur will get better results with forceps than with turning, for if turning is done too early or too late, and extraction bungled, the results will be bad. Some statistics show that the proportion of children delivered alive by forceps is larger than that of children delivered by turning. The mortality to the children delivered by turning arises not in turning, but in extraction.

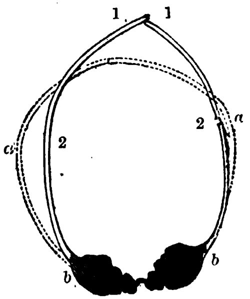

Fig. 85.—Showing Change in Shape of Head produced by Traction with Base in advance. (*After Galabin.*)

Dotted lines, *a a*, *b b*, normal shape of head; continuous lines, 1 1, 2 2, shape of head altered by traction, base in advance.

Advantages in turning.—The advantage of turning is that when the head comes through the pelvis base first, the parietal bones are pressed together from below upwards (Fig. 85). Such pressure tends to flatten them, to make their curve less so that they approach one another at a less obtuse angle, and to make the vertical measurement of the skull greater and the transverse less. If the vertex presents, the pressure of the resistance on the vertex tends to prevent lengthening of the vertical diameters of the head, and therefore to prevent the pressing together of the parietal bones and the shortening of the transverse diameters (Fig. 86). When the head presents in a favourable position this advantage of turning is slight, and is counterbalanced by the risk to the mother in turning and to the child in extraction. When the head presents in an unfavourable position there is a great advantage in turning.

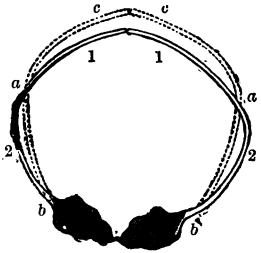

Fig. 86.—Showing Change in Shape of Head produced by downward Pressure with Vertex in advance. (*After Galabin.*)

Dotted lines, *a a*, *b b*, *c c*, normal shape of head; continuous lines, 1 1, 2 2, shape of head altered by pressure from above.

Briefly summed up, the principles of treatment are (in cases of flat pelvis in which the head does not enter the brim) these: Estimate the relative size of the head and pelvis. Artificially hasten dilatation if necessary. If the head is so large that it plainly cannot enter the brim, perforate at once. If the head is engaged in the brim in the most favourable position (that is, with the sagittal suture running transversely and distant about three-quarters of an inch from the sacral promontory) use forceps. If the head is in an unfavourable position, wait till the cervix is *fully* dilated, and then turn and deliver. If by forceps, or pulling on the after-coming head, you cannot get it through, perforate.

THE SMALL ROUND PELVIS.

The difficulty in delivery that comes from the pelvis being of the small round kind, and that from the child's head being too large, are practically the same.

Premature labour.—Difficulty may be prevented by inducing labour prematurely. It has been long recognised as sound practice to induce labour prematurely in a patient who has had difficult labours due to the children being too big.

In this form of pelvic contraction it is more difficult to estimate the proper time at which labour should be brought on, because the diameter which we can most easily measure, the diagonal conjugate, is not, as in the flat pelvis, the key to the probable amount of difficulty. Moreover, the true conjugate cannot so easily be estimated from the diagonal conjugate, because the sacral promontory is higher up than usual, and therefore the deduction to be made in order to get the true conjugate is greater. And the difficulty depends, not only on the conjugate, but on the other measurements of the true pelvis, and these we cannot measure before delivery. For these reasons, a date for premature labour deduced from the length of the diagonal conjugate is in this form of pelvis not likely to prove satisfactory.

The best plan is to instruct the patient to come for examination at a date a month earlier than that to which you think she may safely go, and then to examine the abdomen, so as to judge of the size of the child, and find out also how far the head is engaged in the brim, or how far and how easily it can be pressed into the brim. If the child is small, and the head is engaged in the brim or can be easily pressed into it, tell the patient to come again in a month or a fortnight, according to the ease with which you can press the head into the pelvis. If the head is not presenting, turn the child by external manipulation and get the head over the brim. Watch the growth of the child by successive examinations, and when you find that the head, though engaged in the pelvic brim, is not very movable within it, induce labour without further delay.

First stage of labour.—Leave the case entirely to nature. Neither mother nor child will suffer from delay while the liquor amnii is retained: and the bag of waters will dilate the cervix better than anything else. In this form of pelvis there is no special tendency to premature rupture of membranes. Ascertain carefully the position of the child, and if the back is behind, turn it forwards: if the position be transverse, rectify it.

If the membranes have ruptured before the os is fully dilated, and the head is engaged in the brim, pressing down into the cervix, leave the case to nature. The cervix will be dilated by the head better than by anything else. Sustain the patient's strength by food, and her nerve force by procuring sleep if necessary. It is very unlikely that impaction will occur before the dilatation of the cervix is complete.

Second stage.—The head may become impacted in the pelvic cavity. Now is the time that treatment is required. Impaction means that the head is stuck fast, it neither advances nor recedes. The cervix is usually dilated and retracted over the head before impaction takes place: but it may be nipped and held down between the impacted head and the pelvic wall so that it cannot rise. If there be impaction the need for treatment is urgent, whether the cervix is dilated or not. If the head is left impacted a great caput succedaneum will form and œdema of the vagina and vulva will begin. If the second stage has lasted two hours, notwithstanding strong pains, do not wait for evidence of impaction, but give help. The treatment is to apply forceps and pull. Pull with the pains, not between them. If the result of each pull is to make the head advance, continue to pull with each pain till the head is delivered. If the pains are frequent and your pulling has no effect, auscultate the fœtal heart. If you cannot hear it, perforate. If you can hear it, and the œdema of the vulva is absent or slight, continue pulling with each pain. If after pulling with each pain during, say, an hour, you have not moved the head, perforate, whether the child be alive or dead. In this form of pelvis, or in labour with a large child, there is nothing gained by turning: therefore do not attempt it.

CHAPTER XVII.

THE RARE FORMS OF CONTRACTED PELVIS.

The kinds of contracted pelvis described in this chapter are so rare that you may practise midwifery for years without meeting one of them. The knowledge we have of their obstetric history and treatment is based on compilations of very few cases collected from books. No obstetrician has in his life seen many cases of any one of the following pelves.

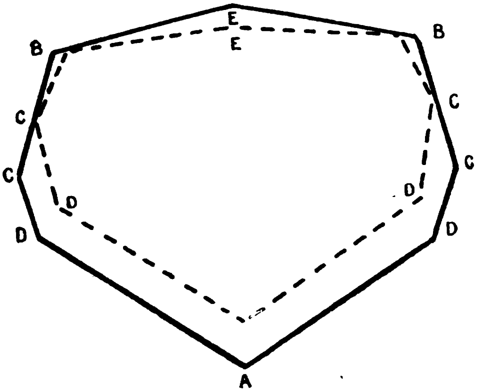

Fig. 87.—Diagram of the generally-contracted Flat non-rickety Pelvis.

Black line, normal pelvis; dotted line, contracted pelvis; E, sacral concavity a brim; B B, sacrum; C C, transverse diameter; D D, ilio-pectineal eminence A, symphysis.

The kinds I first mention are usually classed as varieties of the two common kinds of contracted pelvis—the flat and the small round; but I do not think that any useful purpose is served thereby. The first is considered a variety of the flat pelvis, although it is produced in quite a different way.

The generally-contracted flat non-rickety

pelvis.—A generally-contracted and flattened pelvis is generally rickety; but there are cases presenting the measurements of this deformity without any sign of rickets. These rare pelves differ from the rickety in the following way: The promontory of the sacrum is high above the brim, and its lateral masses are small, as in the generally-contracted pelvis (Fig. 87). But the ilia and the ischia are small, and hence the part of the pelvic ring formed by these bones is short; the sacrum is thus brought nearer to the pubes and the shape of the pelvis made like that of a flattened pelvis (Fig. 88).

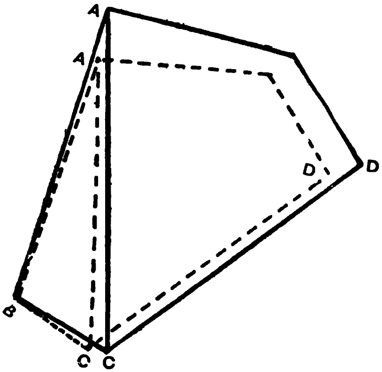

Fig. 88.—Diagram of Pelvic Cavity of generally-contracted flat non-rickety Pelvis.

A B, True conjugate; A C, diagonal; C D, antero-posterior diameter of outlet.

Etiology.—It is due to a defect in development; beyond this we know nothing.

The *diagnosis* is very difficult. Owing to the high position of the promontory the difference between the diagonal and true conjugate is increased, instead of lessened, as in the flat pelvis; and this may lead to the degree of contraction being under-estimated.

The *treatment* is the same as that of the small rickety pelvis.

The three following kinds are usually described as varieties of the generally-contracted pelvis.

The dwarf's pelvis.—This, as its name implies, is met with in dwarfs. It is characterised by smallness in size, with a shape like that of the healthy adult pelvis; and by abnormal delay of union between the three bones which unite to form the innominate bone (Fig. 89). In some cases the sacral promontory has been high up, and the lateral masses of the sacrum small, as in the small round pelvis.

Cases of labour with the dwarf's pelvis are so rare that we know nothing about its obstetric history.

There is a kind of dwarfing in which the stature is small, because the arms and legs are short in proportion to the trunk. This is believed to be the result, when a subject of the intra-uterine disease, to which Parrot gave the name of "*achondroplasia,*" is born alive and grows up. In these dwarfs the pelvis is contracted, but we cannot at present define the characteristic shape of the pelvis: for, so far as I am aware, no specimens have yet been examined after death, and most of the patients examined during life had suffered from rickets as well.*

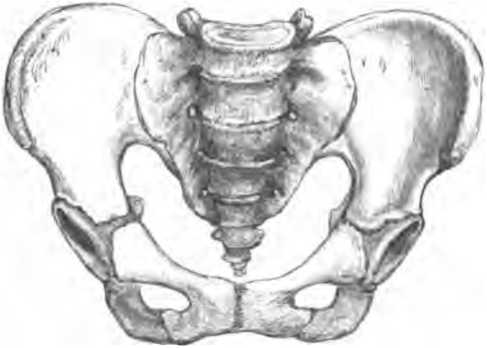

Fig. 89.—Dwarf's Pelvis.

The small round rickety pelvis.—The unknown developmental conditions which produce the small round pelvis do not protect the patient from rickets. If a patient with such a pelvis has rickets, and the rickety changes in the bones are only slight, the pelvis will retain its general shape, but the signs of rickets will be present. The conjugate will be only slightly diminished, the lateral walls of the pelvis easily felt, the sacrum convex from side to side, the epiphyseal ridges prominent. I have seen one case of this deformity.

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* See *Lancet*, Dec. 23, 1893.

Its obstetric history and treatment are the same as that of the small round pelvis without signs of rickets.

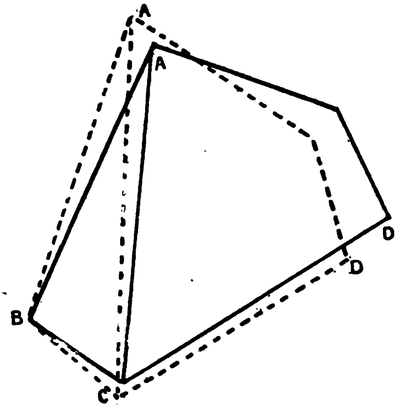

Fig. 90 —Diagram of Cavity of Funnel-shaped Pelvis in Sagittal Plane.

Continuous line, normal pelvis; dotted line, funnel-shaped pelvis; A B, true conjugate; A C, diagonal conjugate; C D, antero - posterior diameter of outlet.

The funnel-shaped pelvis.—By this is meant a pelvis, not associated with any change in the spinal column, whose internal diameters diminish from the inlet to the outlet. Such cases are exceedingly rare. Only two have been carefully measured. The transverse diameter is that in which the contraction towards the outlet is greatest. These pelves have been further classified according to whether or not, and to what degree, the other diameters are diminished also; but seeing how rare such pelves are, this subdivision seems premature. The essential changes seem to be length and narrowness of the sacrum, so that the promontory is higher than usual above the brim, and the difference between the diagonal and the true conjugate is increased, amounting to an inch or more (Figs. 90, 90*a*).

Etiology.—Nothing whatever is known of the cause, beyond that it is a developmental abnormality. Theories about it will be found in German books.

Diagnosis. — With our present methods of examination we cannot diagnose this pelvis during pregnancy. It is first discovered by the difficulty of delivery. After delivery it can only be diagnosed, and that not with precision, by internal examination with the whole hand. This will show the high position of the promontory, and the straightness of the sacrum. The abnormal diminution in the size of the transverse diameter may then be suspected; but exact measurement of this diameter is not possible.

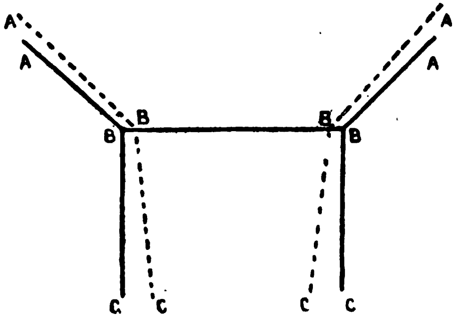

Fig. 90*a*.—Diagram of Cavity of Funnel-shaped Pelvis in Coronal Plane.

Continuous line, normal pelvis; dotted line, funnel-shaped pelvis; A A, iliac crests; B B, transverse diameter of brim; C C, inner surface of tubera ischii.

Effect on labour.—The funnel-shaped pelvis does not prevent the entry of the head into the pelvis. Its only effect on labour is that if the head is large it may be arrested in the pelvic cavity during the second stage. This arrest takes place before the head has come to press upon the pelvic floor, and therefore before the occiput has begun to turn forwards. The effects on the soft parts are the same as in the generally-contracted pelvis. The head may be marked by the spines or tuberosities of the ischium.

The treatment is to deliver with forceps, and if that fail, by craniotomy. If, with a child of average size, presenting with the vertex, craniotomy is required, labour should be prematurely induced in subsequent pregnacies.

The pseudo-osteomalacic rickety pelvis.—In this pelvis, although the softening of the bones is due to rickets, the deformity produced is like that of osteo-malacia (Fig. 91), which will be described later.

The production or not of this form of pelvis depends on (1) the amount of softening of the bones, and (2) whether or not the patient stands or walks much. If the bones are not extremely soft and the patient is able to stand and walk, the heads of the femora, reacting to the body weight, push the acetabula upwards and thus move them outwards, and the usual kind of rickety pelvis is the result. If the patient cannot stand or walk, (*a*) there is no upward pressure of the femora to press the acetabula upwards and outwards, and (*b*) if in addition the bones are so soft as to yield to muscular action, the muscles pull the ischia, ilia, and pubic bones towards the trochanters, and drive the necks of the femora inwards, thus crumpling inwards the acetabula. When this crumpling of the os innominatum has gone far enough to bring the acetabula *within* the line joining the sacro-iliac sychondrosis and the feet, then, if the patient stands or walks, the upward

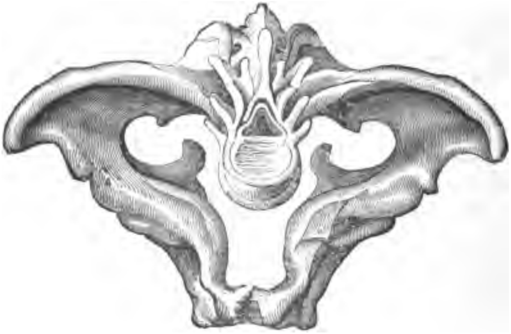

Fig. 91.—Pseudo-osteomalacic Rickety Pelvis. (*After Naegele.*)

pressure of the femora drives the acetabula in instead of out, and thus increases the deformity.

One of the most characteristic cases of this type of pelvis was described by Naegele, and the subject of it did not attempt to walk till the age of seven.

The obstetric history is that of the osteomalacic pelvis, excepting that it is impossible in a pelvis deformed in this way to open up the pelvis with the hand, as has been done in progressing osteomalacia.

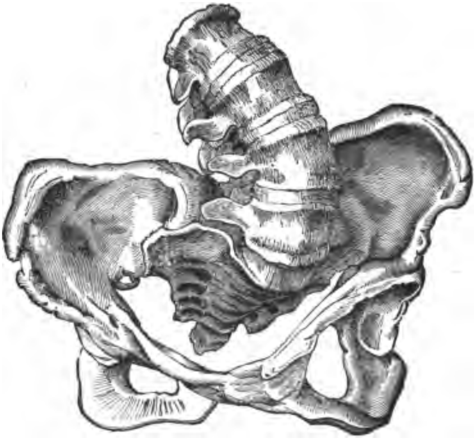

Fig. 92.—Skolio-rachitic Pelvis. (*After A. Martin.*)

The skoliotic pelvis.—Rickets is often associated with lateral curvature of the spine. When this is so, the skoliotic pelvis is produced (Fig. 92).*

The effects of skoliosis of the spine on the pelvis depend on (1) the age at which the skoliosis begins, and (2) whether the bones are softened by disease or not. Skoliosis coming on after the pelvis is ossified, without rickets, does not produce enough pelvic deformity to be obstetrically appreciable. But skoliosis in rickety children produces important modifications in the pelvic deformity.

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* For full information as to this kind of pelvis see Champneys St. Bartholomew's Hospital Reports, vol. xviii., 1882, p. 190.

When the spine is laterally curved, the body weight, instead of falling on the middle of the sacrum, falls on one side of it, viz. the side towards which the convexity of the lumbar curve looks. Hence this side of the sacrum is overweighted, driven down more, and brought nearer to the acetabulum on that side. The acetabulum on the side of the lumbar convexity is thus brought nearer the line along which the body weight acts, and that on the opposite side farther from it. The pressure of the femur nearer the line of the downward pressure acts to greater advantage upwards, and less outwards; that of the opposite femur to greater advantage outwards, and less upwards. In consequence of the former pressure the acetabulum on the side of the lumbar convexity is pushed up, the ilium between it and the sacrum more sharply bent, the sacro-cotyloid diameter shortened. The ischium on that side is pulled out, because the distance between the origin and insertion of the muscles attached to it is increased by the upward movement of the femur. The increased outward pressure on the less weighted side pulls the symphysis pubis over towards that side, and causes the wing of the ilium to look more forward. The sacro-cotyloid diameter on this side is greater than on the side of the lumbar convexity (Figs. 93, 93*a*).

Diagnosis.—The presence of lateral curvature of the spine in a rickety subject will at once suggest that the pelvis, if the skoliosis is of early date, is of the skolio-rachitic form. The fact that the pelvis is asymmetrical can be exactly noted by taking the same measurements as in diagnosing the Naegele pelvis (page 230). But the only measurements really valuable, from an obstetrical point of view, are the internal ones: the conjugate, and the right and left sacro-cotyloid measurements. All these are shortened, and the latter measurements are unequal. The prospect of safe delivery depends on the size of the larger sacro-cotyloid measurement. These measurements must be guessed at with the fingers, or measured with the whole hand in the pelvis.

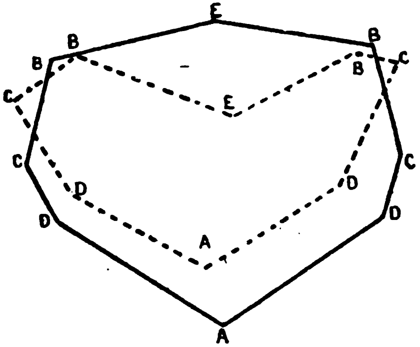

Fig. 93.—Diagram of Brim of Skolio-rachitic Pelvis.

Continuous line, normal pelvis; dotted line, deformed pelvis; B B, sacro-iliac synchondroses; E, centre of sacrum in plane of brim; C C, transverse diameter; D D, pectineal eminences; A, symphysis pubis.

Treatment.—In slight cases, natural delivery may

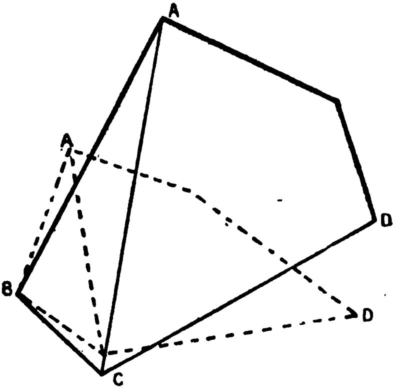

Fig. 93a.—Diagram of Cavity of Skolio-rachitic Pelvis.

Continuous line, normal pelvis; dotted line, deformed pelvis; A B, true conjugate; A C, diagonal conjugate; C D, antero-posterior diameter of outlet.

take place, and the treatment is that of the flat pelvis. When the smaller sacro-cotyloid is below two inches and a half, craniotomy will be required, unless the child be very small. Below this the choice is between craniotomy and Cæsarian section. In marked cases the latter operation is usually necessary. Slight cases are not common enough to enable rules for treatment to be laid down with precision.

Rickets may be associated with both angular and lateral curvature of the spine; and when these diseases occur with rickets in early life, we have the kypho-skoliotic pelvis. To understand this, it is necessary first to comprehend the production of the kyphotic pelvis. This I shall, therefore, next describe.

The kyphotic pelvis.—In angular curvature of the spine the upper limb of the angle is so inclined forward that without some compensatory change the body would fall forward. When the angle is high up, the compensation is made by great lordosis of the lumbar spine, and no effect on the pelvis is produced. When the curvature is so low down that change in the curve of the spine below it is not enough to compensate for the change in the incidence of pressure produced by the angle, a change in the inclination of the pelvis takes place, and this change in the inclination gradually produces change in shape.

In the diagram (Fig. 94), C G represents the upper limb of the kyphosis. The weight of the upper part of the body acts along this line, in the direction of C G I; G P represents the lower limb of the angle; P is the sacral promontory; P C the sacrum. It will be seen that the effect of the pressure is to drive the angle of the kyphosis downwards and backwards, and thus to pull P upwards and backwards. The direction of the pelvic brim is changed, so that its plane would, if its shape were unaltered, form a less angle with that of the horizon. But the pull on the sacral promontory acting continuously for years gradually makes the curve from above downwards less, raises the promontory above the level of the brim, and lengthens the conjugate diameter of the brim. The concavity of the sacrum from side to side is increased, just as in rickets it is changed into convexity; in rickets the bodies of the vertebræ are pushed down, in kyphosis pulled up, the lateral masses being in either case bound by ligaments to the ossa innominata (Fig. 95). The tip of the sacrum moves forward as the promontory moves back, so that it projects into the outlet and narrows it (Fig. 96). The base of the sacrum pulls with it the sacro-iliac synchondroses, and then the shape of the os innominatum is altered, although this change is not so great as that of the sacrum. The curve of the ilio-pectineal line is not so sharp (Fig. 97). The most important change of the ossa innominata is that of position. The lessened inclination of the pelvis causes great strain on the ilio-femoral ligaments. These pull the anterior inferior iliac spines down and out, and so rotate the ossa innominata about an axis running from before backwards, separate the ilia, and turn in the ischia. Hence the outlet is contracted transversely, the transverse diameter at the inlet slightly widened, the conjugate much lengthened. The degree of these changes depends on how low down the kyphosis is.

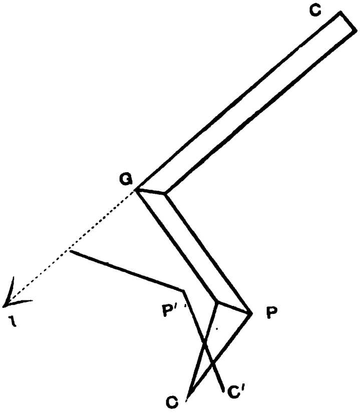

Fig. 94.—Diagram illustrating the Production of Kyphotic Pelvis.

G, Angle of kyphosis; PP′, promontory of sacrum CC′, tip of sacrum.

Although angular curvature of the spine is a common disease, yet high degrees of kyphotic shape of pelvis are rare, because they only occur when the spinal disease begins early, and affects the spine low down.

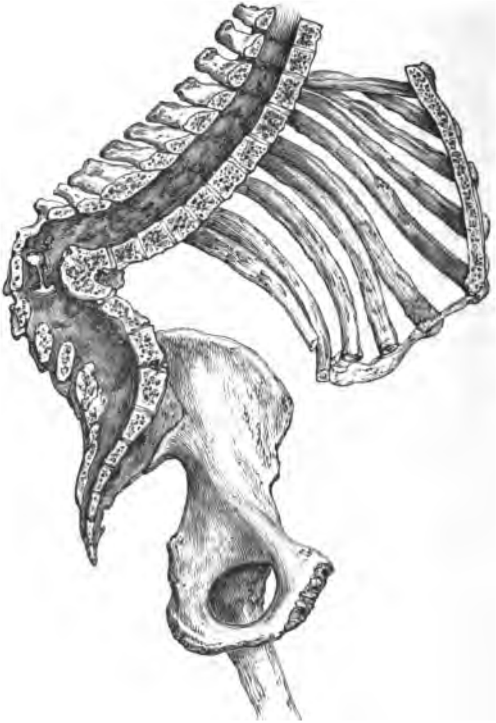

Fig. 95.—Kyphotic Pelvis. (*After Barbour.*)

The *diagnosis* is not difficult, because the patient's short stature and hump back suggest examination of the spine, by which the angular curvature is detected. Then the pelvis should be examined, and the measurements of the outlet taken with care. Those of the brim are difficult to take accurately, and as they are all increased, the amount of increase is not important.

Influence on labour.—The course of labour with the kyphotic pelvis depends on the degree of the deformity. The few cases that have been accurately observed make our knowledge as yet not so exact as it will be.

In consequence of the convexity of the lumbar spine being gone, there is no longer the correspondence between the convexity of the spine and the concavity of the abdominal aspect of the child, which is the chief reason why the back of the child is generally in front. Hence with the kyphotic pelvis occipito-posterior positions are proportionately more frequent. The position of the rectum on the left side makes presentations in the right oblique diameter more frequent than those in the left.

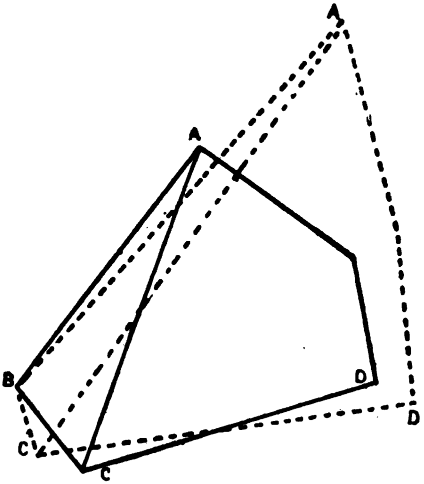

Fig. 96.—Diagram of Cavity of Kyphotic Pelvis in Sagittal Plane.
Continuous line, normal pelvis; dotted line, deformed pelvis; A B, true conjugate; A C, diagonal conjugate; C D, antero-posterior diameter of outlet.

The turns which the head makes in its passage through the pelvis depend on the degree of deformity.

If the contraction of the outlet is so slight that the head can pass through it, the result is, that instead of the occiput waiting, as it usually does, to make its turn forward until it has passed the bony outlet and begun to distend the perineum, it turns forward while in the pelvic cavity, the turn being produced by the bones, instead of by the pelvic floor, as is usual But when the deformity is very great the occiput cannot turn forwards, because the pubic rami are so close together that there is not room for the occiput to pass out between them. In that case it turns back, guided by the bones, and, if it be small enough, the head emerges in an oblique diameter through the space bounded by the ischia in front and the coccyx behind. It has been seen thus to be turned back by the bones, and then, when the head had passed the bones, the soft parts turned the occiput forwards, there being room for the neck between the pubic bones, though not for the head.*

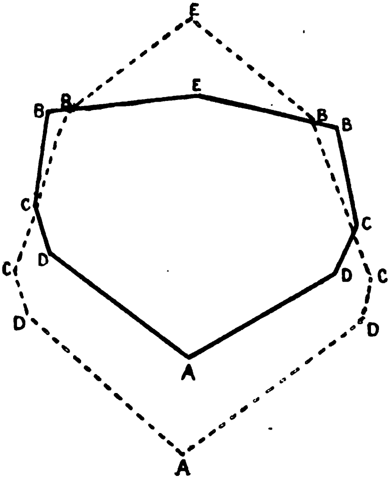

Fig. 97.—Diagram of Brim of Kyphotic Pelvis.

Continuous line, normal pelvis; dotted line, kyphotic pelvis; A, symphysis; B B, sacro-iliac sychondroses; C C, transverse diameter; D D, ilio-pectineal eminences; middle of sacrum in plane of brim.

Treatment.—In any patient with kyphosis of the spine the pelvic outlet should be carefully measured. But it is so difficult to measure accurately the outlet that it is not possible, unless the deformity be extreme, to predict difficulty in labour. Even if the measurements are small, they may be slightly increased owing to mobility of the pelvic joints. But if the distance between the tubera ischii, at the point of insertion of the sacro-sciatic ligaments, is not more than three inches, labour should be induced at the end of the seventh month. If there be doubt, let the pregnancy take its course, and then, from information gained in the first labour, advise as to the induction of labour or not, in the event of subsequent pregnancy. When labour has begun there is no advantage in turning. If delivery is difficult, use forceps. If this fail, perforate. The kyphotic pelvis is very rarely so contracted as to call for Cæsarian section, but cases have occurred in which this was necessary. Such extreme deformity as this ought to be recognised early in labour, and the operation done before the patient is exhausted.

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* See Champneys, Obst. Trans., vols. xxv. and xxviii.

The kypho-skoliotic rickety pelvis.*—This, as its name implies, is the pelvis produced by the combination of angular and lateral curvature of the spine in a rickety subject (Fig. 98). The kyphotic and the rickety pelves are almost exactly opposite to one another in shape. This pelvis is a sort of compromise between them. The sacral promontory is drawn up, the tip tilted forward, and the sacrum lengthened and straightened from above downwards, as in the kyphotic pelvis; but it presents the rickety convexity from side to side and thickening of the epiphyseal lines. The ilio-pectineal line is longer and straighter, the conjugate diameter at the brim increased, the transverse slightly diminished, as in kyphotic pelvis, but not to so much (Figs. 99, 99*a*). The transverse at the outlet is diminished. The general shape of the pelvis is therefore funnel-shaped. In addition to this, the pelvis is unsymmetrical, the sacro-cotyloid diameter on the side of the lumbar convexity being shortened, and the symphysis pubis pulled over to the opposite side.

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* See Professor Leopold's monograph, "Das skoliotisch und kyphoskoliotisch rachitische Becken," Leipzig, 1879.

The description above given is that of the usual form of kypho-skoliotic pelvis. Exceptional pelves have been described, due to exceptional forms of curvature.

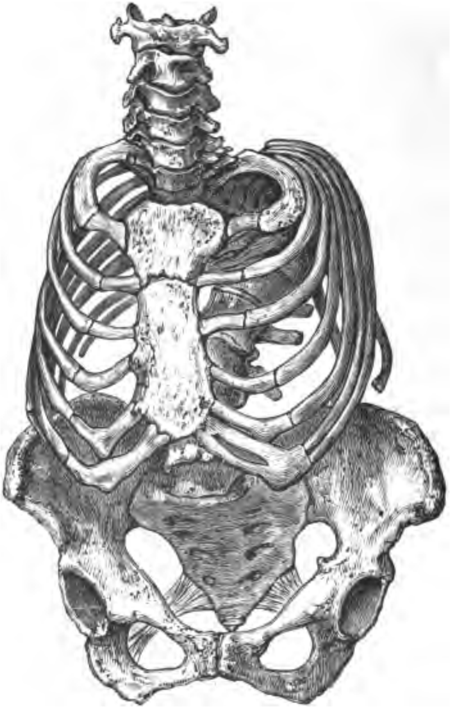

Fig. 98.—Kypho-skolio-rachitic Pelvis. (*After Leopold.*)

Diagnosis.—This will be suggested by the kind of spinal curvature present, and must be made by careful measurement of all the pelvic diameters.

Treatment.—This depends upon the size of the pelvis, and whether the pelvis approaches more to the kyphotic or the rickety type. According to this, the

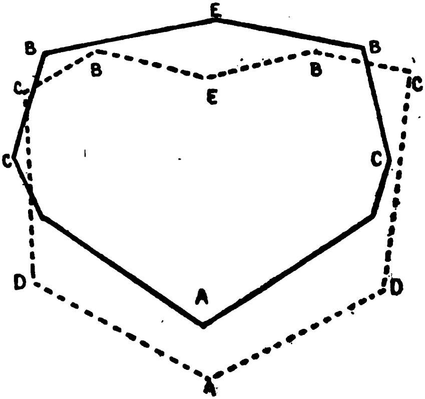

Fig. 99.—Diagram of Brim of Kypho-skolio-rachitic Pelvis.

Continuous line, normal pelvis; dotted line, deformed pelvis; B B, sacro-iliac synchondrosis; E, centre of sacrum in plane of brim; C C, transverse diameter; D D pectineal eminences; A, symphysis pubis.

treatment is that either of the kyphotic or the rickety pelvis.

The next form of contracted pelvis I describe

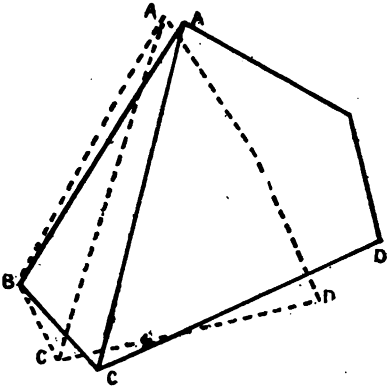

Fig. 99a.—Diagram of Cavity of Kypho-skolio-rachitic Pelvis

Continuous line, normal pelvis; dotted line, deformed pelvis: A B, true conjugate; A C, diagonal conjugate; C D, antero-posterior diameter of outlet.

resembles the rickety pelvis in being due to softening of the bones.

The osteomalacic pelvis.—Osteomalacia is a disease endemic in certain parts of Europe, but very rare in England.

It produces extreme softening of the bones, much greater than is ever found in rickets. The softening is so great that the bones yield to the pull of the muscles, as well as to the body weight. The muscles pull out the ischium, the os pubis, and the ilium, and drive in the head of the femur, crumpling inwards the acetabula. When the acetabula have been so far bent in that the line of upward pressure of the heads of the femora is internal to the sacro-iliac synchondrosis, then the reaction of the femora to the body weight acts inwards and upwards, and presses the acetabula towards the middle line. Hence results the characteristic Y-shape of the brim of the osteomalacic pelvis (Fig. 100). The tubera ischii are pulled out by the muscles attached to them. The sacrum yields to the body weight, as in the rickety pelvis, but more. The promontory is pressed down and forwards so far that the fifth or even the fourth lumbar vertebra may come to lie in the plane of the brim. As the central part of

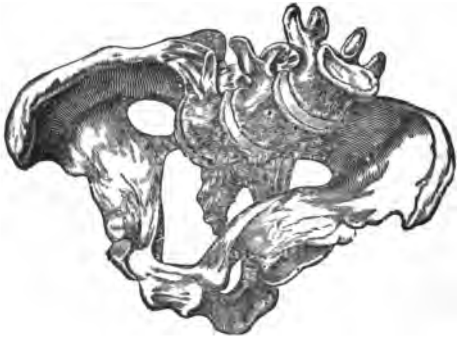

Fig. 100.—Osteomalacic Pelvis.

the bone is pressed down by the body weight, while the lateral masses are held up by the ligaments passing from them to the ilia, the sacrum becomes extremely convex from side to side. From this curvature it is also narrowed transversely.

The sacro-iliac ligaments pull the posterior superior iliac spines inwards. The sacro-sciatic ligaments prevent the lower end of the sacrum from retreating backwards, as the pushing down and forwards of the promontory would otherwise make it do: hence the lower part of the sacrum is sharply curved forwards, as in the rickety pelvis, but more so, so that the projection of its point contracts the pelvic outlet. Sometimes the sacrum is not only deformed, but has slipped forwards, so that a part of the auricular surface of the ilium which should be in côntact with the sacrum is uncovered by it; and sometimes the ilium is so bent that the sacrum and ilium are separated from one another at part of the synchondrosis. The ilia are so crumpled by the pull downwards of the sacral ligaments behind, and the push upwards of the femora in front, that the shape of the bone forms a deep furrow between the sacrum and acetabulum. The two pubic bones are pressed together so that the symphysis sticks out like a beak: hence this pelvis is sometimes called the "*rostrate*" pelvis.

The bones are so soft that the patients cannot stand or walk, but sit or lie in various attitudes. The deformity is often unsymmetrical, from the patient's attitude causing the pressure on the two sides to be unequal. Further, the bones may be at some places softer than at others, and this will modify the manner in which they yield to pressure. Therefore all osteomalacic pelves are not exactly alike, although the general type above described holds good.

Diagnosis.—Osteomalacia begins during pregnancy or lactation. It is accompanied by severe pain, especially on movement. The spine becomes curved, hence the length of the trunk is diminished. There are cough, shortness of breath, suffocative attacks, muscular cramps. There is an excessive excretion of phosphatic salts in the urine.[*] After the removal of the ovaries this excess of phosphates disappears, pain ceases, and the bones harden. It has been found that removal of the ovaries in healthy animals is followed by lessening of the amount of phosphates in the urine.[†] These facts point to a dependence of osteomalacia upon an excess of the internal secretion of the ovary. The older physicians thought that excessive excretion of phosphates depended upon disorders of the nervous system, of which excessive activity of the genital organs was one of the causes. This theory was much used by quacks for their own purposes: but it would seem not to have been altogether without foundation. But the diagnostic signs on examination are two—(1) the extreme tenderness of the bones; (2) their softness, so that the pelvis can be forced open with the hand.

The shape and dimensions of the pelvis are ascertained with sufficient exactness by digital exploration. The deformity is so extreme that exact measurement is not needed.

Treatment.—The projection of the promontory in osteomalacia may lead to incarceration of the pregnant uterus and retention of urine, with its effects. In such a case, after emptying the bladder, put a tent in the cervix, and after the tent has expanded empty the uterus. The risk of going to term is so great that the early induction of abortion is the best course; and the retention of urine, if it leads to the early discovery of pregnancy, may be a good thing.

At term, if the disease is active and the bones are soft, it may be possible with the hand to force apart the bones, and thus open up the pelvis enough for delivery to take place. This has several times been done. Try first to do this.

If the pelvis cannot be forced open, deliver by Cæsarian section followed by removal of the ovaries, or by Porro's operation, according to your skill as an operator and the circumstances in which you operate. Porro's operation is a proper mode of delivery in osteomalacia, because the disease is cured by removal of the ovaries. It may get well—that is, the pains cease and the bones get hard—spontaneously, but we know of nothing that will cure it except removal of the ovaries.

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[*] See Neumann, *Arch. für Gyn.*, Band xlvii.

[†] See Curatolo, Obst. Trans., vol. xxxviii., 1896.

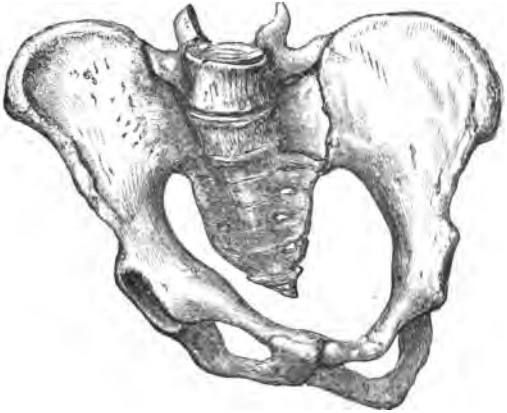

Fig. 101.—Obliquely-contracted Pelvis of Naegele.

Osteomalacia goes on so fast during pregnancy that by the time term is reached the deformity is extreme. In a slight case, just beginning before delivery, which had only had time to produce slight deformity, the deformity would probably not be noticed, as the bones would yield before the hand, especially if aid were given by pulling. Hence we only have to consider treatment in extreme degrees of deformity.

The Naegele pelvis.—The obliquely-contracted pelvis of Naegele (first described by him in 1832) is due to defective development of the lateral mass of the sacrum, and bony union of the sacrum with the ilium, on one side. In every respect but this the bones are healthy (Fig. 101).

From this deformity the pressure of the body weight and the counter-pressure of the femora act unequally on the two sides. The pressure of the femora is upwards, and, being outside the line along which the body weight is transmitted from the sacrum to the feet, tends to move the acetabula outwards. On the diseased side the femur is nearer the middle line than on the sound side. Therefore on this side the pressure is mainly upwards, very little outwards. On the sound side the outward pressure is exerted to greater advantage, and therefore the directly upward pressure is less. Hence on the sound side the acetabulum is pushed farther outwards than usual; the wing of the ilium looks more forwards and less inwards than usual; the symphysis pubis is pulled over to the sound side (Fig. 102). On the diseased side, in consequence of the more directly upward pressure, the ilium between the acetabulum and synchondrosis is compressed and therefore thickened.

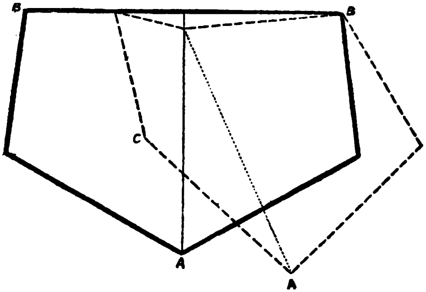

Fig. 102.—Diagram of the Brim of the Oblique Pelvis of Naegele.
Continuous line, normal pelvis; dotted line, oblique pelvis; B B, sacrum; C C acetabula; A, symphysis pubis.

The Naegele pelvis is very rare. We know nothing whatever about its causes. It is certain that it is due to a developmental defect, and not to disease, because all specimens are exactly alike and there is no sign of bone disease. There is no history of any injury or disease or lameness. The patient is quite unaware of any disease or deformity. The defective development of the sacrum is the essential condition for its formation, and not the ankylosis, for in some cases there is no ankylosis, and yet the oblique deformity is present.

Diagnosis.—Examine the patient on her back. Trace the outline of the iliac crests, and notice their asymmetry. Note the displacement of the pubic symphysis towards the side on which the ilium looks forwards. Examine the back, and measure the distance between the posterior superior iliac spines and the sacral spines. The distance will be less on the diseased side. Take with callipers the distance between the posterior superior iliac spine of one side and the anterior superior iliac spine on the other. That measurement will be the greater which starts from the diseased side behind. Finally, examine by the vagina, and feel the outline of the pelvic wall as far as you can. You will be able to feel nearly the anterior half, and to perceive the different shape on the two sides.

The important point obstetrically is the diminution of the oblique diameter taken from the sacro-iliac synchondrosis on the sound side to a point above the middle of the obturator foramen on the side of the ankylosis. This can only be measured during life by inserting the whole hand. If the labour is to end naturally the head must be small, and it must enter the pelvis with the occiput towards the obturator foramen on the sound side. In the labours which have been reported, only about a quarter of the children survived.

The *treatment* of pregnancy with a Naegele pelvis is to induce labour at the end of the seventh month. At term, if the head is small enough to come down into the pelvis, leave it to nature. If it is large and remains above the brim, perforate and deliver with the cephalotribe. If it has entered the brim but does not make progress, try the forceps; but if the instrument slips or does not quickly bring down the head, do not prolong the trial, but perforate. There is no advantage in turning.

The transversely-contracted pelvis of Robert.—This is one of the rarest contracted pelves. Eight specimens only have been described. In it there is deficient development of the lateral mass of the sacrum on both sides, and ankylosis of the sacrum to the ilia (Fig. 103). The narrowness of the sacrum contracts the pelvis transversely; and in addition, from the pressure of the femora being applied so near the middle line, the ossa innominata are not pressed apart so much as usual. The sacrum is pushed slightly forwards between the ilia, and the ilia are less curved. From the great vertical pressure upon it, the sacrum is convex from side to side, and its upper part is convex from above downwards.

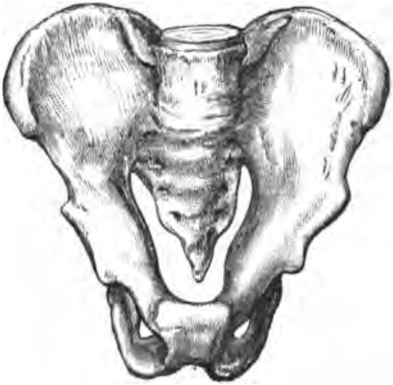

Fig. 103.—Transversely-contracted Pelvis of Robert

In the pelvis of Robert we have thus an extreme degree of the developmental defect which produces the generally contracted pelvis.

Some pelves have been described under this title in which the lateral masses of the sacrum were unequal in their defect of development, so that the pelves were asymmetrical. Such pelves form a transition between the oblique pelvis of Naegele and the transversely-contracted pelvis of Robert.

Two pelves have been described, in each of which not simply the lateral masses, but the greater part of the body of the sacrum, was wanting. I need not give further details of these curiosities.

The *diagnosis* is made by the transverse measurements: those between the iliac crests, anterior and posterior, iliac spines, and the trochanters—all these are diminished. By internal examination, the closeness of the ischial tuberosities, the small angle which the pubic bones make with one another, and the high position of the promontory will be recognised without difficulty.

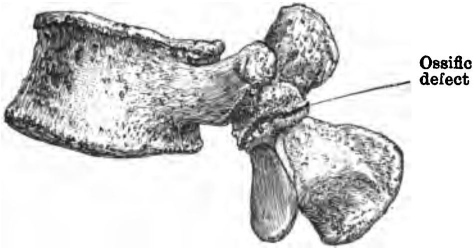

Fig. 104.—Lumbar Vertebra: showing the defect in ossification upon which spondyl-olisthesis depends. (*From a specimen in the London Hospital Museum.*)

The *treatment* consists, if the patient is seen within the first four months of pregnancy, in the induction of abortion. When this is done, it is not easy to empty the uterus on account of the difficulty of getting at it, owing to the depth and narrowness of the pelvis. After this date the patient must go to term, and then be delivered by Cæsarian section.

Spondyl-olisthesis.—This means a slipping of a vertebra (from *σπόνδυλος*, a vertebra, and *ολίσθησις* slipping). It is the pelvic deformity produced by the slipping forward of the body of the last lumbar vertebra on the sacrum.

It is produced by the coincidence of two conditions: (1) a malformation; (2) strain. 1. The malformation (Fig. 104). It is not uncommon for the ossification of the last lumbar vertebra to be imperfect from non-union of parts ossified from different centres,

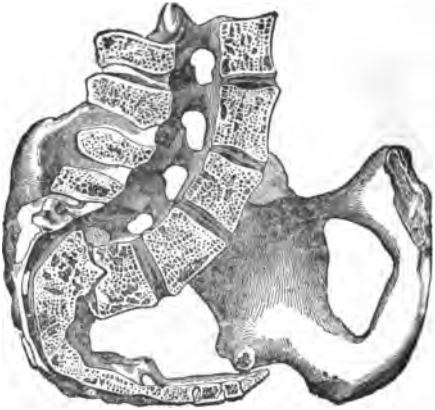

Fig. 105.—Spondyl-olisthesis. (*After Kilian.*)

so that at the part of the bony ring between the upper, and lower articular processes there is a gap filled with cartilage or with fibrous tissue. While spondyl olisthesis is rare, this bony defect (called *spondylysis articularis*) is common. It is not by itself sufficient to produce the deformity. 2. Strain. If a patient with this malformation has to do very heavy labour, or by violence the spinal column is suddenly driven down, the last lumbar vertebra may give way at this weak spot, and the body of the vertebra, with the upper articular processes, slip forwards, while the rest of the bone remains in its place. This will take place gradually if from over-strain, suddenly if from violence. It is believed by some that spondyl-olisthesis may arise without any defect in ossification, by (1) fracture of the articular processes of the sacrum, thus letting the last lumbar vertebra, with the articular processes of the sacrum, slide forward; or (2) fracture of the interarticular portion of a properly ossified last lumbar vertebra. Both these occurrences are hypothetical. The mode of origin first described is the only one that has been demonstrated.

Secondary changes.—When this dislocation has occurred, the altered mechanical conditions under which the bones concerned are placed produces changes in them (Fig. 105). From the dislocation (*a*) the canal of the last lumbar vertebra is enlarged from before backwards. (*b*) The body of the vertebra, in its new position, is not supported in front, so that it sinks down, and its anterior part forms an angle, opening downwards, with its posterior. (*c*) Between the sacrum and the vertebra above, it is compressed behind, so that it becomes the shape of a blunt wedge, the base of the wedge being in front. (*d*) The slipping forward of the last lumbar vertebra throws unusual strain on the intervertebral substance between it and the first sacral vertebra. (*e*) The result of this strain is the growth of bone in the intervertebral substance, and in the angle between the displaced lumbar vertebra and the first sacral vertebra. This ossification tends to prevent further dislocation, and therefore is a conservative change.

The deformity has been divided into four stages, according to the degree of displacement of the last lumbar vertebra: (1) when it projects, (2) hangs over towards the pelvic brim, (3) has sunk into the brim, (4) has sunk into the pelvic cavity.

The sacrum is altered. Instead of the body weight (transmitted through the spine) pressing down on the upper surface of the sacrum, it presses down and back on the front edge of this surface. Hence the upper part of the sacrum is displaced backwards.

This backward pressure on the sacrum tends to flatten and narrow the sacral canal.

There is extreme lordosis of the lumbar spine, so that the front edges of the bodies of the vertebræ are farther apart than they should be, while the hinder parts,—the articular processes and neural arches—are pressed together, and this pressure may lead to bony outgrowths, ossification of the ligaments, and finally synostosis.

The sacrum being pressed backwards, separates the ilia and makes the posterior superior iliac spines farther apart from one another.

The inclination of the pelvis to the horizon is diminished, and the effect of this is to throw increased strain on the ilio-femoral ligaments. The pull of this ligament rotates each os innominatum about an antero-posterior axis, so that the upper part of the bone is turned outwards, the lower part inwards (as in the kyphotic pelvis). Hence the transverse diameter at the brim is widened, at the outlet narrowed. The spondyl-olisthetic pelvis thus has the general characters of the kyphotic pelvis, *plus* great contraction in the conjugate of the brim. The extent to which these changes go depends upon the degree of the spondylolisthesis.

The defect in ossification upon which spondylolisthesis depends may be present on only one side. In that case the last lumbar vertebra will slip forwards more easily on the side of the spondylysis, and an unsymmetrical deformity will result. But the disease is so rare that I need not describe the various modifications in particular specimens due to the greater or less advance of the morbid change, and to its more or less asymmetry.

Diagnosis.—The investigation of a case of supposed spondyl-olisthesis is conducted along three lines.

First, *the history*. This will be of some violence or strain, leading to a long illness severe enough to keep the patient in bed, and attended with pain in the lower part of the back. The usual date of this illness is about from the fifteenth to the eighteenth year of life.

Second, *the shape of the body.* The patient is short, and this diminution of stature is from shortening of the lumbar spine. There is great lordosis. The ribs are sunk (in a bad case) into the false pelvis. This makes conspicuous the great breadth between the wings of the ilia, The back of the sacrum is plainly felt, and the posterior superior iliac spines are farther apart than usual. From the less inclination of the pelvis the genitals look more forwards than usual, less downwards. The patient walks with short steps, and the feet are slightly inverted, so that the mark made by the foot is deficient in breadth.

Third, *examination of the pelvis.* The displaced lumbar vertebra is felt narrowing the brim. It is distinguished from the projecting promontory of a rickety pelvis by the facts that externally no displacement forwards of the sacrum is perceived, and that on the side of the projecting vertebra nothing like the lateral masses of the sacrum is felt. You must not expect to feel a distinct angle between the displaced lumbar vertebra and the sacrum, because this angle is filled up by new bone. The nearness of the ischia to one another, and the displacement forwards of the tip of the sacrum are like what is felt in the kyphotic pelvis.

In caries of the last lumbar vertebra and top of the sacrum the deformity produced is called *spondylolizema.* In this case the angle of the kyphosis may be so acute that the lower lumbar vertebræ are inclined over the pelvic brim like a roof: hence this pelvis and the spondyl-olisthetic have been described under the common name of the *pelvis obtecta.*

Treatment.—The treatment of labour with spondylolisthesis depends upon the degree of the deformity. This is estimated by the length of the obstetrical conjugate. The more this is shortened the more marked will be the other changes in the pelvis also. In the different degrees of deformity the induction of labour, forceps, turning, craniotomy, or Cæsarian section should be chosen according to the rules given for the treatment of labour with the flat pelvis.

Deformity from fracture.—Pelvic deformity may be produced by fracture of the pelvic bones. I have seen a case in which the pelvic measurements, taken during life, were such as would have indicated the transversely-contracted pelvis of Robert, were it not that the history was that in childhood the wheel of a cart had passed over the patient's pelvis. Asymmetrical deformity may be produced by fracture of one pelvic bone only. But fracture of the pelvic bones is so often accompanied by fatal injury to the viscera, that cases are rare in which difficult labour is due to deformities caused by fracture. The possible kinds of deformity, depending as they do upon the seat of the injury, the number of the fractures, the dislocation of the fragments, etc., are too various to admit of description.

The treatment must depend upon the data gained by careful measurement of the pelvis.

The coxalgic pelvis.—Disease of the hip-joint occurring in childhood, and leading as it does to altered nutrition of one side of the pelvis, to non-use of one limb, and often to dislocation of the head of the femur, is accompanied with deformity of the pelvis. The deformity varies so much with the extent of the disease, the age of the patient, and the presence or absence of dislocation, that general statements as to the nature of the deformity cannot be made. All that can be said is that long-standing hip disease in children does produce deformity.

There are some other pelvic deformities which do not make labour difficult, but which are important on account of the light they throw on the forces which mould the pelvis during growth.

The fœtal or lying-down pelvis.—This is a very rare form of pelvis occurring in subjects who, although they have reached adult age, have never walked, and whose genital organs have never developed. In this case the changes produced in the shape of the pelvis during growth by the pressure of the body weight and the upward reacting pressure of the femora, do not occur, and the pelvis remains of the same shape as that of the fœtus.

As the genital organs in these cases are not developed, there is no obstetric history to the fœtal pelvis. Its value is that it shows the influence of the upward pressure of the femora in widening the pelvis; that when this pressure has not acted, the pelvis is not widened.

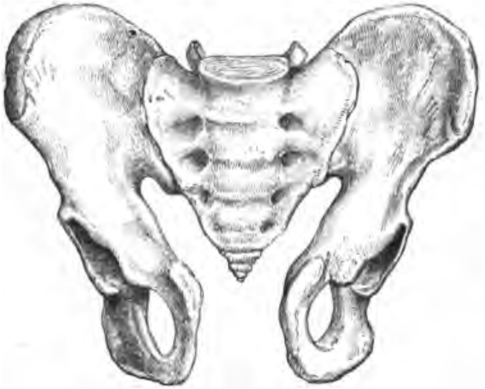

Fig. 106.—Split Pelvis.

The split pelvis (Fig. 106).—In this deformity the symphysis pubis is absent. The result is that the tendency of the pressure of the femora to press outwards the acetabula is not so powerfully opposed as in a normal condition. The bones are united in front by some fibrous tissue, but this is a weak tie compared to the normal joint. There is at birth a gap between the pubic bones, and during growth this gap is increased. The upward pressure of the femora rotates the bones about the sacrum, so that the posterior iliac spines approach one another. This shortens the distance spanned by the ligaments suspending the sacrum from the ossa innominata, and therefore the sacrum is allowed to slip forwards and downwards. The approach to one another of the posterior iliac spines and the sinking forwards of the sacrum in extreme cases reaches such a degree that it looks as if the bones enclosed a canal behind instead of in front, and this has led Ahlfeld to give it the name of the "inverted pelvis." The general outline of the pelvis is that of an extreme form of rickety pelvis, but the gap in front prevents it from causing any great difficulty in labour. Only seven cases of labour with this pelvic deformity have been recorded.*

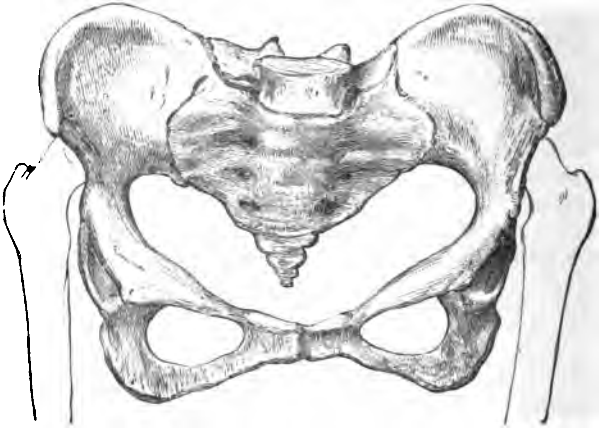

Fig. 107.—Pelvis of Congenital Dislocation of the Hips.

This pelvis is interesting as showing the direction in which the pressure of the femora really acts. If the femora pressed inwards, they should press the two pubic bones together ; but they do not.

It is almost always associated with extroversion of the bladder, and therefore pregnancy with it is rare. Only six instances have been recorded.*

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* For an account of them, see Theodor Klein, *Arch. für Gyn.*, Band xliii.

The pelvis of so-called congenital dislocation of the hips.—This is a very interesting pelvis, although it gives rise to no difficulty in labour, because it shows the effect of altered pull of muscles in changing the shape of the pelvis.

The so-called dislocation is due to a defect in the acetabula, so that the heads of the femora slip up on to the dorsa ilii. The upper end of the femur is therefore higher up than it ought to be. The result is that the origins and insertions of the glutei muscles are brought nearer together. Hence the glutei do not pull out the alæ of the ilia as much as usual, and therefore they are steeper, more nearly vertical than normal (Fig. 107). The origins and insertions of the muscles passing from the tubera ischii to the femur are, on the contrary, brought farther away from one another; and hence the tubera ischii are pulled out more strongly than usual, and the outlet of the pelvis is consequently widened. These are the main changes. The pelvic bones are very slender. This is probably because the defect in growth which makes the acetabula imperfect affects also the thickness of the bones. The pelvis is also much inclined to the horizon, the sacrum being more nearly horizontal than usual. This is from the pull of the ilio-femoral ligaments and the iliacus muscle, the attachments of which to the femur are carried by the dislocation farther away from their pelvic origins. The femora, when dislocated, lie in a socket formed by fibrous tissue attached to the dorsum of the ilium, and support the pelvis by the pull of this fibrous tissue, This pull is applied a little farther out than the highest part of the acetabulum. Hence the outward pressure of the femora is applied to a little greater advantage than in the normal pelvis, and the pelvis is consequently slightly widened.

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* See Klein, *Arch. für Gyn.*, Bd. xliii.

When the dislocation is on one side only, the pelvis is widened slightly on that side, and the symphysis is pulled a little over to the side of the dislocation.*

Mixed forms.—Lastly, in the shape of the pelvis as well as in the other bodily structures, and in the features of disease, we get anomalous cases that are exceptions to the rules which hold good of pelves generally. A negro, with his black skin, woolly hair, flat nose, and prominent jaw, cannot possibly be taken for a white man, yet in countries where the two races are mixed we may find subjects who inherit negro blood and yet have paler skins, straighter hair, more prominent noses, and less prominent jaws than some white men. Just so, although a flat pelvis differs in the ways that have been described from a small round pelvis, yet we may have exceptional pelves presenting some features of one form, some of another. Thus there is in London a pelvis the measurements of which show it to be a small round pelvis, but its sacral promontory is quite low down. In the museum of the London Hospital there is a pelvis quite normal as to all its measurements, but which has a double promontory.

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* In some text-books other changes are described as being the result of one-sided dislocation. These descriptions are got by putting together all sorts of dislocations in all sorts of pelves. A dislocation in a rickety pelvis, or one the result of caries of the acetabulum, is not the same thing as a congenital dislocation in an otherwise normal pelvis. In the latter the changes are as described above.

CHAPTER XVIII.

SLOW DILATATION OF THE SOFT PARTS.

Labour may be slow when there is no bony obstruction, malposition, or excessive size of the child; the soft parts may be long in becoming canalised. The part that has to be most dilated is the cervix, and therefore delay from this cause is usually evident in the first stage of labour.

"Rigidity" of the cervix.—Slow dilatation of the cervix uteri in labour is often said to be due to rigidity of the os uteri. Two kinds of rigidity are described, or implied, in most text-books. One is rigidity from disease recognisable independently of labour, such as cancer, fibroids, scar tissue, etc. Such cases are rare. The other is rigidity of a cervix which is healthy, but presents resistance to dilatation which is unusual, and supposed to be abnormal. These cases are very rare, if they exist at all, but in the experience of unskilful accoucheurs are very common. When a healthy cervix does not dilate properly it is because the natural dilating force is absent. A healthy cervix will always dilate when the bag of membranes is driven into it: and the rate of its dilatation depends mainly upon the force and frequency with which this natural dilator is pressed into it.

There are some conditions which make the cervix slow in dilating. What, then, are the *causes of slow dilatation of the cervix?*

1. **Premature delivery.**—During the last few days of pregnancy the circular fibres round the internal os are inhibited; and the longitudinal fibres, during the painless uterine contractions of pregnancy, pull open the internal os, so that the cavity of the cervix becomes a part of the uterine cavity. This is the preparatory stage of labour. Sometimes the internal os is

expanded, and the membranes rest on the os externum, as early as the seventh month of pregnancy: but this is not the rule. It is generally supposed that this preparatory stage takes place during the last fortnight of pregnancy, but we have no exact knowledge either as to the frequency of variations from this date or the conditions on which such variations depend. Exact knowledge could only be got by frequent vaginal examination throughout pregnancy, and this is impracticable. Now, premature labour may come on or be induced before this preparatory stage is completed, or even begun. If this be so, the dilatation of the cervix will be slow. The bag of membranes, instead of having to stretch open the external os only, has to dilate first the internal os, then the external. Therefore a slow first stage is natural in premature labour.

2. **Premature rupture of the membranes.**—This is the great cause of slow dilatation of the os uteri in labour at term. No part of the child can come down into the os while it is small, as the bag of membranes does. This is a mechanical disadvantage, from the dilating agent being an imperfect one. The larger the os is when the membranes rupture, the less the disadvantage. There is also a physiological disadvantage. The bag of membranes pressing into the os stimulates by reflex action the body of the uterus. When the bag bursts too soon and the presenting part does not press into the os, this stimulant is wanting, and the pains are consequently few and feeble.

Suppose now that this misfortune has happened, how should the case be treated?

Treatment.—If the child be presenting with the head or breech, watch the effect of some pains. If the presenting part comes well down into the pelvis during a pain, so that it puts the cervix on the stretch, and can be pushed up between the pains (this proving that there is not impaction), although the dilatation will be slow (not because the cervix is rigid, but because the dilator is a bad one), yet it will be better to leave the process to nature. Direct your treatment to maintaining the patient's nerve force by food and sleep. If the pains are strong and frequent, see that the patient takes plenty of food. If they are weak and infrequent, support her strength by food in the daytime, and at night (or in the daytime if she be sleepy), give her chloral, or opium, or both, so that she may sleep, and her nerve force be recuperated. As she is probably anxious and in pain, she will need a larger dose than usual. Tr. opii ʒss may be given, or gr. xl of chloral: or tr. opii ♏ xxv with chloral ʒss. Chloral has a remarkable effect in favouring dilatation of the cervix; but whether it should be called a specific effect, or whether its action on the cervix is only through its influence in calming the nervous system, and thus restoring nerve force, is not quite certain. There is no doubt of its value.

3. **The presenting part cannot enter the brim.**—Premature rupture of the membranes often happens because the presenting part does not fill the os uteri, and shut off the "fore waters" from the general intra-uterine pressure. In such a case after rupture of the membranes the presenting part does not come into the os uteri to dilate it. This may happen either from transverse presentation, or from contraction of the pelvic brim. Premature rupture of membranes, therefore, if rightly understood, may be a useful warning of trouble ahead. If the case be let alone, the uterine muscle will in time pull open the cervix. But it will take a long time to do it, and there will be danger, if the head is above the brim, of the cervix getting nipped between the head and the pelvic brim, and so being prevented from rising.

In cases of this kind, as soon as it is clear that the presenting part is not descending into the cervix to stretch it open, the best practice is to supply the place of the natural dilator by an artificial one.

Your choice of a dilator must depend upon circumstances. Although the cervix is not dilated, it may be dilatable. The larger the os, the thinner and softer its margin, the more likely it is that full dilatation will be quickly brought about by a dilating force. This condition—viz. when the cervix, though not fully dilated, is dilatable—is the only one in which delivery before full dilatation of the cervix is good treatment. If, then, the os uteri is big enough to admit four fingers, and its thinness and softness, together with the fact that the presenting part does not put it in the stretch during a pain, lead you to infer that the absence of a dilator is the only thing at fault, examine carefully the size of the pelvis, the size and position of the child. If the vertex is presenting in a favourable position and the equator of the head not high above the brim, put on forceps. If the child is transverse, or presenting with the breech, or the head in an unfavourable position, such as a face or brow presentation, bring down a foot. If the equator of the head is high above the brim, and the pelvic brim is so contracted that you judge that a living child cannot be born, perforate.

If the os will admit one or two fingers, but not more, dilate it with Barnes's, or, better, Champetier's bag, and then deliver by forceps, turning, or craniotomy, as the conditions present indicate. The slow dilatation is here merely one of the features of labour with contracted pelvis.

4. **Primary uterine inertia.**—Slow expansion of a healthy cervix, the membranes being entire, is simply due to weakness of the pains. It requires no treatment but patience, and ʒss of chloral not oftener than once in four hours. No harm whatever (except fatigue) can result from prolongation of the first stage of labour with the membranes intact.

Sometimes the pains in the first stage of labour are very frequent and very painful, but of short duration and producing little effect. I think it probable that pains of this kind may be the beginning of the "premature uterine retraction" described in chapter XI. But, as I have found treatment effective, I have not seen the one condition pass into the other, and my opinion is nothing but a conjecture. I have seen this state of things altered in a wonderful way by antipyrin. Ten grains given every two hours will lessen the suffering and convert short, frequent, weak pains into prolonged effective pains at longer intervals. This drug has no influence on normal labour.

5. **Influence of age.**—The soft parts stretch better in young subjects than in old. Hence in women who begin to have children late in life the cervix takes longer to dilate, and the first stage of labour is longer. The soft parts at the floor of the pelvis do not stretch so easily, and therefore the second stage of labour takes longer, and rupture of the perineum is commoner. Delay in labour from this cause should only be treated by patience and support of the patient's strength by food and sleep. Although statistics * show that there is a difference between young and old primiparæ in the duration of labour, yet this difference is not very great, and is not altogether due to the state of the soft parts. Contracted pelvis and its consequences are more frequent among older patients, for the simple reason that patients with deformity or defect in development are usually later in marrying than the well-built.

The foregoing are the causes of slow dilatation of a healthy cervix. The *diseases* which prevent dilatation are so rare that what we know about the best way of treating them can be briefly stated.

Scar tissue.—Part of the tissue of the cervix may be replaced by scar tissue from amputation of the cervix, or from cauterisation, or destruction of tissue in some other way. Scar tissue dilates badly. In such a case make numerous small incisions, radiating from the os as a centre. Use either scissors or a probe-pointed bistoury. In the latter case wrap plaster round all but the terminal inch of the cutting edge, so that you may be sure of only cutting the part you want to cut.

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* See Erdmann, *Arch. für Gyn.*, Band xxxix.

Hypertrophic elongation of cervix.—Organic disease of the cervix with pregnancy is rare. Dr. Roper has observed labour with the elongation of the cervix that accompanies the second stage of prolapse; and it was long. But we have not a sufficient number of cases to show whether the long labour was due to the state of the cervix or to conditions peculiar to individual cases. Cæsarian section has been done for obstructed labour from this cause; but I do not think this ought to be done again. The knowledge we have of this condition goes to show that the cervix will dilate, even if slowly.

Smallness of the os externum.—There are rare cases in which, although the cervical canal has been opened up, the presenting part has come down upon the os externum, and labour pains have lasted for many hours, even, it may be, for days; yet the os externum remains so small that the finger will not enter it, and the bag of membranes does not protrude through it; it may even be difficult to identify it. There is no sign of any disease to account for this. The inhibition of the muscular fibres surrounding the os externum, which should be present at the beginning of labour, is here morbidly absent. We have no certain knowledge why: but it is supposed that in such cases there may be congenital smallness of the os externum. This view is only theoretical, for no case has been recorded in which the size of the os before the pregnancy was known. But it is plausible, as this course of events has only been seen in first labours. The *treatment* is to dilate the os artificially. First pass into it bougies, gradually increasing in size; then the finger; then, if you have it, Champetier's bag. This instrument will dilate the os to its full size, and then you can deliver. If you do not possess this bag, after passing one finger through the os, pass in two, then three, then four; and thus make the os large enough for the presenting part of the child to enter it and dilate it.

Cancer.—Pregnancy may take place with *cancer.*

When cancer of the cervix causes hindrance to delivery, the disease is so advanced that there is no difficulty about the diagnosis. The cervix is thickened, from the new growth; and the new growth is one which breaks down, so that its surface is ulcerated and irregular. Cancer in so early a stage that diagnosis is difficult does not hinder dilatation. The course of the first stage of labour depends on the hardness or softness of the growth. If the cancer be soft, easily breaking down, the cervix will dilate as quickly as a healthy cervix. If it be hard, even though limited to a part of the cervix, it will greatly hinder dilatation. Here the obstacle to dilatation is really in the cervix.

Treatment.—If the natural bag of membranes will not dilate the cervix, it is no use using an artificial fluid dilator. Take a probe-pointed bistoury, guarded as described above, and make numerous small incisions in a direction radiating from the centre of the os, through the diseased part. If there are good pains, the bag of waters will finish the dilatation. If by incisions the cervix is enlarged to four-fifths of its full dilatation, aid the uterine efforts by forceps.

Craniotomy v. *Cæsarian section.*—If, notwithstanding incision, the os does not yield, or if the cancerous mass is so big that, although the rest of the cervix is expanded, its mere bulk obstructs delivery, and the child is living, the choice lies between craniotomy and Cæsarian section. If craniotomy is done, the child is sacrificed. The mother is certain to die, probably at latest within a few months; and in the crushing and extraction of the child the obstructing mass is sure to be bruised and torn, and may in consequence get inflamed or gangrenous, and thus lead to the mother's more speedy death. Taking all these things into consideration, it is better, when cancer of the cervix forms a mass large and hard enough to obstruct the birth of a living child, to perform Cæsarian section, which will save the child, and leave the cancerous tissue uninjured. The cancerous cachexia often kills the child; therefore be sure that it is alive before you perform Cæsarian section. The risk to the mother from the two operations is about the same.

Removal of cancer.—If the cervix is movable, and the cancer is of the vaginal portion, it should be removed. The complete removal of the cervix during labour is impracticable. But as much of the cancer as impedes the dilatation should be cut away, and then the membranes ruptured, so that the head may come down upon the bleeding part and stop the hæmorrhage. The bleeding from cutting away a lump of cancer is seldom formidable. Then, after delivery, if the uterus continues movable, the cervix should be completely removed as soon as the involution of the pelvic vessels has so far advanced that great hæmorrhage during the operation need not be feared. In about a fortnight involution will have advanced to this degree.*

Cancer at outlet.—Delivery may be impeded by cancer of the vagina, vulva, or rectum. I consider this obstruction to delivery here, although it might seem to belong more properly to the next chapter, because the principles of treatment are the same. If the growth is so small as to be removable, it should be removed. If not, the treatment depends upon its hardness or softness. If it is soft, the child will be delivered naturally. If it is hard, then the choice must be made between craniotomy and Cæsarian section, guided by the considerations pointed out above.

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* See a Paper by the Author, Obst. Trans., vol. xx.

CHAPTER XIX.

LABOUR COMPLICATED WITH TUMOURS.

Labour with ovarian tumour.—The dangers which a patient who is pregnant and has an ovarian tumour incurs when labour comes on, depend in the first instance upon the *size* of the tumour. Contrary to what might be expected, the danger with labour is rather greater with small tumours than large. The reason is that small tumours are liable to get into the pelvic cavity, where they are in the way of the child; while large ones are too big to remain in the pelvis, and therefore do not obstruct delivery.

Natural terminations.—Consider first what may happen when a small ovarian tumour is in the pelvic cavity, in the way of the child.

1. If it is small enough and the child not too large, the child may be driven past it (Fig. 108). The tumour is squeezed and the labour made longer, but there may be no other ill effect. It is not possible to define what size of tumour will allow this, because the event depends on the size of the fœtal head and of the pelvis, as well as on that of the tumour.

2. The tumour may be got out of the pelvis. It may be pushed up by the attendant; or by some movement of the patient, or, as some think, by uterine contraction (pulling on the ligament of the ovary) it may be moved up; and if it get so far moved up that the equator of the head gets below the equator of the tumour, then the head will advance into the pelvis and push the tumour farther aside.

3. If the tumour be not moved up and is too big for the head to pass it, the head being driven down on to it may rupture the tumour. When ruptured, the tumour will generally collapse enough to let delivery take place. Such rupture usually takes

place into the peritoneal cavity. The effect of the rupture depends upon the nature of the cyst contents. The fluid of a tumour that has not undergone any degenerative or necrotic change is innocuous. An ovarian tumour has ruptured into the rectum: this is very rare.

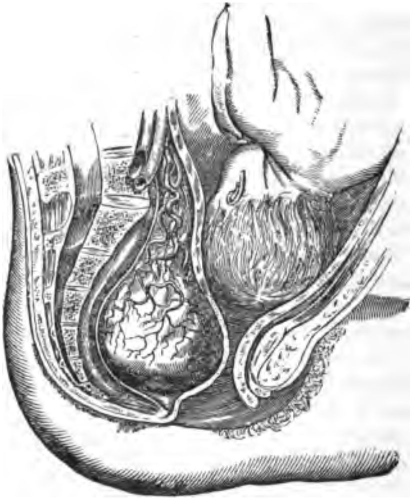

Fig. 108.—Ovarian Tumour obstructing Delivery. (*After Tyler Smith.*)

4. Very often—it is to be hoped in most cases—this process is anticipated by the attendant, who punctures the tumour and draws off the fluid by the vagina.

Possible accidents.—When the tumour is in the abdominal cavity and is large, the patient suffers increased discomfort during pregnancy, from the great size of the belly. Labour is apt to be lingering, because the distension lessens the bearing-down power of the woman. There is no special tendency to malpresentations.

During delivery, rotation of the tumour and twisting of its pedicle are apt to occur, from the combined effects of the diminution in size of the uterus, the straining of the patient during the pains, and the manipulations of the medical attendant. The pedicle has even been torn through, but this is very rare. A tumour which before the birth of the child was in the abdomen has been known to get into the pelvis after delivery and obstruct the exit of the placenta.

Treatment.—A large ovarian tumour situated in the abdomen is pretty sure to have been discovered during pregnancy; so that it is seldom that this has to be dealt with as a difficulty of labour. The best treatment is to remove the tumour, even if labour has commenced, unless labour has so far advanced that it is likely that the child will be born before the necessary preparations can be made and the operation completed. If your experience in abdominal surgery is not large enough to justify you in undertaking this, or if you have not the necessary skilled assistants, or would have to treat the case in circumstances unfavourable to the satisfactory carrying out of the operation and the after treatment, then tap the tumour, and thus lessen its size.

When a small ovarian tumour lies in the pelvic cavity and obstructs the passage of the child, the first question is, Can it be pushed up? If you can push it above the brim, out of the way of the child, this is the way to deal with it. You will do it more easily by putting the patient in the knee-elbow position. You may have to put the whole hand in the vagina; and if so, chloroform will be advisable.

If you cannot push the tumour out of the way, as may be the case if strong pains are forcing down the head, the alternative is to puncture it with a trocar. If you have not a trocar with you, or if, while the tumour presents the elasticity which suggests fluid, no fluid flows through a trocar (as may happen if the contents of the tumour are unusually viscid), cut into it with a knife. Have ready two threaded needles, and put in a stitch on each side of the cut, uniting the cyst wall and the vagina.

A still better practice would be to perform vaginal ovariotomy; that is, to incise the vagina freely, bring out the tumour, transfix and ligature the pedicle, and cut away the tumour. But it would be absurd to say that it is the doctor's duty to attempt this when, suddenly summoned to what he expects to be an ordinary confinement, he finds the second stage of labour in progress and the tumour obstructing the birth of the head.

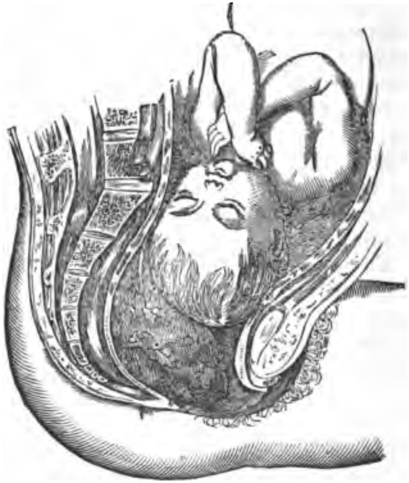

Fig. 109.—Labour impeded by Uterine Polypus. (*After Tyler Smith*.)

Labour with fibroids.—The danger of fibroids complicating labour depends in the first place on their seat. The higher in the uterus the tumour, the less the danger. When a tumour is high up, labour may be ended just as if there were no tumour, and the presence of one may not be suspected. If the fibroid be low down, it is possible that it may not obstruct delivery, for the uterine contractions may pull it up above the brim; and even when this has not happened, a fibroid tumour has been pushed down by the advancing head till it was outside the vulva, and thus the pelvic canal was left quite free. Such a process puts tension on the uterine attachment of the tumour, elongates it into a stalk, and may sever it (Fig. 109).

Dangers.—If delivery is not made possible by either of these methods by which nature avoids difficulty, and the tumour remains in the pelvis obstructing the passage of the head, the event will depend on the relative size of the tumour and the child's head, and on the strength of the pains. If the tumour is not too large and the pains are strong, the child may be driven past it, squeezing and flattening the tumour against the pelvic wall as it passes. If the tumour is too big to allow this, and the labour goes on unrelieved, the course is just as in obstructed labour from any other cause: the uterus passes into a state of tonic contraction, and either the mother dies of exhaustion or *rupture of the uterus* takes place.* Fibroids sometimes favour the occurrence of rupture by causing degenerative processes in the uterine wall.

Besides the direct obstruction to delivery which fibroids situated low down present, they may indirectly affect labour unfavourably by causing *malpresentations.*

The most frequent danger to which fibroids give rise is that of *post-partum hæmorrhage*, both primary and secondary. They do this in more than one way—first, the tumour in its wall prevents the uterus from contracting properly, and thus the great safeguard against hæmorrhage is impaired; and, secondly, the fibroid itself cannot contract at all, and the placenta may be implanted on the fibroid: in that case, when the placenta has been separated, hæmorrhage is only stopped by thrombosis of the vessels. Throughout the lying-in the tumour acts just as it does when the patient is not pregnant; it is an irritant to the uterus, provoking a flow of blood to, and hæmorrhage from the endometrium.

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* I have published a case in which Cæsarian section was required on account of the obstruction caused by a fibroid fixed in the hollow of the sacrum. (*New York Journal of Gynæcology and Obstetrics*, June, 1893, p. 484.)

The most dangerous complication directly resulting from the presence of fibroids is *inversion of the uterus.* This may be produced in the third stage of labour or in the puerperal state in the same way as it is in the non-pregnant condition, the tumour, by uterine contractions aided by bearing-down efforts, being driven down and dragging the fundus uteri after it. It has been accidentally produced by the fibroid being taken for the head of a second child and pulled down by the attendant.

Treatment.—If the tumour obstructs the entry of the presenting part into the brim, push it out of the way if you can. If you cannot, deliver as in labour obstructed by tumours springing from the bones. (See page 259.) If there be malpresentation, perform cephalic or podalic version. If there be post-partum hæmorrhage, put your hand in the uterus and see if you can remove the tumour. I have known a fibroid thus enucleated with the hand after delivery. If you cannot, treat the case as you would post-partum hæmorrhage from any other cause. If inversion of the uterus occur, reduce it at once; and then enucleate the tumour if possible.

Fibroid of the cervix.—Fibroids sometimes, though rarely, grow in the cervix. A small fibroid in the cervix will make no appreciable difference in the course of labour. One of the size of a walnut or larger will hinder dilatation, partly because it will not alter its own shape and will prevent the part of the cervix in which it lies from expanding properly, and partly because it will prevent the head from entering the os.

Treatment.—A fibroid of the cervix is accessible. The treatment is to remove it. Take a duckbill speculum and hold back the posterior vaginal wall so as to expose the fibroid. Then with a bistoury make an incision over the whole length of the tumour, through the mucous membrane covering it. Then seize the tumour with a volsella and strip the mucous membrane off it, and then separate the tumour from its bed with the finger. Then rupture the membranes, to stimulate the uterus to contract, and apply a strong binder, so that the head may come down on the bleeding part and stop the hæmorrhage.

Tumours of the pelvic bones.—Delivery is occasionally made difficult by obstruction from tumours of the bones.

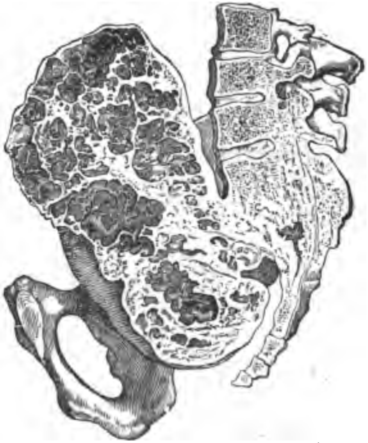

Fig. 110.—Sacral Exostosis.

The following are the chief tumours met with :—

1. *Exostoses.*—Three sorts are met with : (*a*) Some grow from the places where there is cartilage —the sacral promontory, the symphysis pubis, the sacro-iliac synchondrosis (Fig. 110). Sometimes these outgrowths are sharp-pointed, and to the pelvis so diseased has been given the name of the *acanthopelys*, or the *spiny* or *thorny pelvis.* When the uterus or vagina is nipped between these sharp outgrowths and the head, the wall of the genital canal may be cut or bored through, and thus an especial liability to

rupture of uterus or vagina is conferred by this pelvis. (*b*) Spines are especially apt to grow on the ilio-pectineal line just over the middle of the acetabulum—that is, where the ilium and os pubis join—and along the crest of the pubes; and it has been suggested that they are really due to ossification of the tendon of the psoas minor and of Gimbernat's ligament, and not outgrowths from the bone. (*c*) The pelvic bones may also be thickened by periostitis.

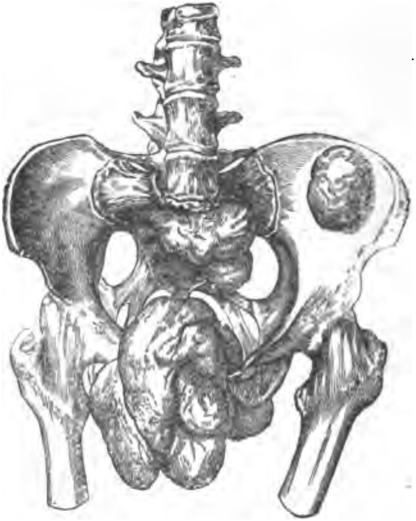

Fig. 111.—Cancerous Growths from Pelvic Bones.

2. *Enchondromata.*—These and sarcomata are the commonest large tumours in the pelvis. Most of the cases described in the older literature as large exostoses were probably enchondromata. Enchondroma grows from near the sacro-iliac synchondrosis, and has a great tendency to calcification and the formation of cysts. A tumour of this kind may grow as large as a child's head.

3. *Fibromata.*—These tumours grow from the periosteum—most often from that of the iliac crest, less often in the pelvic cavity. They are seldom large, but have been met with of such a size as to make delivery impossible.

4. *Sarcomata.*—All forms of sarcoma grow sometimes in the pelvis, especially osteo-sarcoma, and may reach a great size, quite blocking up the pelvis. I have published such a case.*

5. *Carcinomata*—Carcinomatous nodules in the pelvic bones (Fig. 111) are always secondary, never primary. Cases described as great masses of cancer by old authors were probably sarcomata.

Diagnosis.—The diagnosis of tumours of the pelvic wall is to be made by careful vaginal *and rectal* examination. You will thus detect that the tumour is continuous with the bones, and is not connected with the mucous canals. *Enchondroma* is identified by its size, its growing from near the synchondrosis and its unequal consistence, hard spots alternating with soft ones; *sarcoma*, by its rapid growth, softness, and vascularity; *fibroma*, by its firmness, smoothness, uniformity of surface, and slowness of growth, and by the absence of impairment of health. *Carcinoma* may be suspected if the patient has had a primary cancer somewhere else and is cachectic.

Treatment.—As the situation and amount of obstruction are infinite in variety and differ according to the seat and size of the tumour, no general rule can be laid down except this: measure with the fingers internally the size of the pelvic canal at the place where the tumour encroaches on it, and then proceed as in contraction of the bones to a like degree. The only difference is, that as attempts to drag a mutilated child past a new growth may inflame the growth, and so endanger life, Cæsarian section should be undertaken more readily than in bony obstruction.

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* *Lancet*, May 2, 1891, p. 986.

CHAPTER XX.

RUPTURE OF THE UTERUS.

Rupture of uterus apart from obstructed labour.—Rupture of the uterus has been referred to in foregoing chapters as a result of obstruction to delivery. But rupture of the uterus is not always the result of lingering labour. The womb may be *ripped open* by violence, or be ruptured by *crushing*, as, for instance, from a pregnant woman being run over. It has been *perforated* in criminal attempts at abortion. When pregnancy has followed delivery by *Cæsarian section* the uterus has ruptured (even during pregnancy) at the site of the scar. *Interstitial pregnancy* ending in rupture, has been often described as "rupture of the uterus," although it is pathologically quite a different thing from rupture of an ordinary pregnant uterus. Some rare cases have been reported in which the uterus has ruptured *spontaneously*, that is, without violence, and without disease perceptible to the naked eye, during and at the end of pregnancy, occurring in the latter case before labour had apparently commenced. Such cases seem comparable to spontaneous rupture of the heart and of the rectum. They have been attributed to fatty, fibrous, or tubercular *degeneration* of the uterus; but no morbid change has been demonstrated in such cases; nor can we in the least predict, or prevent, or explain them. Such cases, as to their symptoms and treatment, resemble rupture the consequence of obstructed labour. There are also some few cases, to which the above remark also applies, in which the uterus ruptures during short and easy labours, without any obstruction.

Rupture from obstructed labour.—The great majority of uterine ruptures come from *obstructed* *labour*. The process is the same whatever the obstruction: whether the child be too large or the pelvis too small, or the child in a malposition. For convenience, I describe it as happening when the head presents. Remember first what takes place in natural labour.

Changes in the uterus during natural labour.—In pregnancy, before uterine contractions begin to be painful, the circular fibres around the internal os are inhibited; the longitudinal fibres of the uterine body then pull the os open, and thus the cervix, instead of being a narrow canal leading to the uterine cavity, comes to form part of it. The os uteri internum measures, instead of a quarter of an inch or so in diameter, nearly four inches across: and the cervix, instead of being a thick cylinder enclosing a spindle-shaped canal, becomes the shape of a saucer, the external os being in the middle of the saucer. The cervix cannot be expanded like this without being thinned. Early in the first stage of labour the lower segment and cervix of the uterus cover the head like a hemispherical cap. The os externum, even when only big enough to admit the finger, is bounded by a thin edge, quite different to the thick soft cervix of pregnancy. During the first stage of labour the part of the uterus above pulls up this hemispherical cap, converting it into a cylinder. It is helped to do this by the dilating force of the bag of membranes in the os externum. In this process of canalisation the part that has to stretch the most, and therefore to be thinned the most, is the part near the external os. The part that has to stretch and be thinned the least is that just below the greatest diameter of the head. Hence in a labour in which everything has so far gone on without difficulty or accident, the wall of the uterine canal would be thin near the os, and from this part upwards its thickness would gradually increase, without sudden alteration in thickness anywhere. In some museum specimens this is what is seen.

The different parts of the uterus and their functions.—The uterus, from the point of view of labour, consists of three parts.

1. The part above the greatest diameter of the head, which does nothing but contract. As it contracts it gets thicker.

2. The part between the greatest diameter of the head, and the os internum. This part is called the *lower segment of the uterus.* It is from one- to two-fifths of an inch thinner than the part above, and in the first stage of labour has to stretch and get thinner still, the amount of thinning being greatest at the part nearest the os internum. But it is muscular tissue, and although it stretches open transversely, yielding to the dilating force of the bag of membranes, yet it contracts like the rest of the uterus after the head has passed through it.

3. Lastly, the part below the lower uterine segment is the cervix. This is composed mostly of fibrous tissue, and its function is simply to dilate and thin; it does not contract. It is easily identified by the folds of its mucous membrane, called the *arbor vitæ uterinæ.*

The lower uterine segment.—The definition of the lower uterine segment as "the part below the greatest diameter of the head" is unsatisfactory, because it is not an anatomical definition, but a statement of the relation that, under certain conditions, the wall of an organ bears to its contents. If the child is transverse, for instance, the statement is no longer correct. Attempts have been made to supply a better definition. Thus it has been defined as the part of the uterus corresponding to the pelvic inlet. It generally does correspond to it, but not always. I think the best anatomical definition is that it is the part corresponding to the line of firm attachment of the peritoneum. It is evident that as the peritoneum is the least elastic part of the uterine wall, its firm attachment must be a considerable hindrance to the stretching of the muscular wall, and the looseness of its attachment low down is physiologically associated with the capacity of the uterine wall to stretch. The muscular fibres of the lower uterine segment are differently arranged from those of the upper part of the uterus; they are arranged in laminæ, like the leaves of a book, and can be split asunder with the handle of a scalpel. But, with some trouble, the upper part of the uterus can also be shown to be composed of laminæ; and, therefore, this difference is not one which enables us to draw a sharp line of demarcation. The lower uterine segment, unlike the cervix, is covered inside with decidua; but at the end of pregnancy this decidua is very fragmentary, and you may, after making sections, fail to find it.

Condition after easy labour.—After an easy labour there is no abrupt difference in thickness between the cervix and lower uterine segment, or between the lower uterine segment and the upper part of the uterus. The cervix is thin, and the lower uterine segment gets thicker and thicker as you follow it up. In the majority of first labours the expansion of the cervix does not take place entirely by the process of thinning described above; when the cervix is nearly fully expanded it commonly tears. The presence of these tears of the cervix is one of the best signs of past childbearing that we have. When a cervix has once been torn, its expansion in subsequent labours is easier and quicker.

Condition after obstructed labour.—When there is obstruction and the presenting part of the child does not advance through the uterine canal, the upper part of the uterus goes on contracting, and the lower part goes on stretching and getting thinner, till at length there is a sharp distinction: an abrupt increase in the thickness of the uterine wall at a particular level, and at this point a lessening in size of the uterine circumference, so that this line projects as a ridge internally, and can be felt as a furrow externally (Figs. 112 and 113). This line has been called by the different names of "*Bandl's ring*," after the Austrian obstetrician who first described it, the "contraction ring," and the "retraction ring," the last name expressing the fact that it is the lower boundary of the retracted part of the uterus. There is a difference of opinion as to the anatomical situation of this ring, whether (*a*) it coincides with the os uteri internum, or (*b*) is formed higher up. Specimens have been described, and are to be seen, which clearly show it (*a*) just above the arbor vitæ—that is, at the internal os. In other specimens (*b*) it seems much too high for this. The probable explanation appears to be

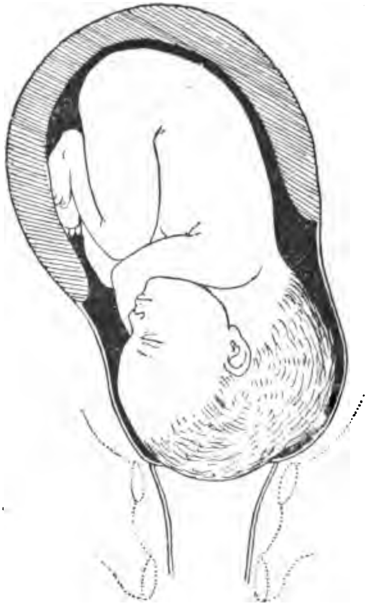

Fig. 112.—Diagram showing Thickening of the upper Part of the Uterus; Thinning and Stretching of the Lower Uterine Segment; Labour obstructed by Hydrocephalus. (*After Bandl.*)

that (*a*) the first part to be thinned out is the cervix; and that (*b*) if obstructed labour goes on after the cervix has reached its utmost thinning, then the lower uterine segment in its turn thins. If (*a*) rupture of the uterus takes place before the lower segment of the uterus has thinned, the specimen will show a retraction ring at the internal os. If (*b*) the lower uterine segment has had time to thin, then the retraction ring will be at the level of firm attachment of the peritoneum. This view is at present hypothetical, but it reconciles apparently conflicting observations, and is supported by specimens which show a retraction ring at the level of firm attachment of the peritoneum, and gradual thinning of the lower uterine segment from that point down to the os internum, as if the thinning were in progress (Fig. 114), but not complete.

Mode of uterine rupture.—When the head presents and the pelvis is so contracted that the head cannot enter the brim, if the membranes rupture before the dilatation of the cervix is complete, the head may come down on the cervix and pin it against the edge of the pelvic brim so that it cannot rise up. This is especially apt to occur

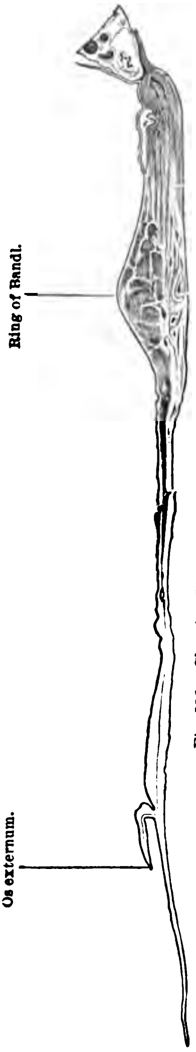

Fig. 113.—Showing Thinning of Lower Uterine Segment.

(Drawn by Dr. T. W. P. Lawrence, by permission of Dr. John Williams, from a specimen in the Museum of University College.)

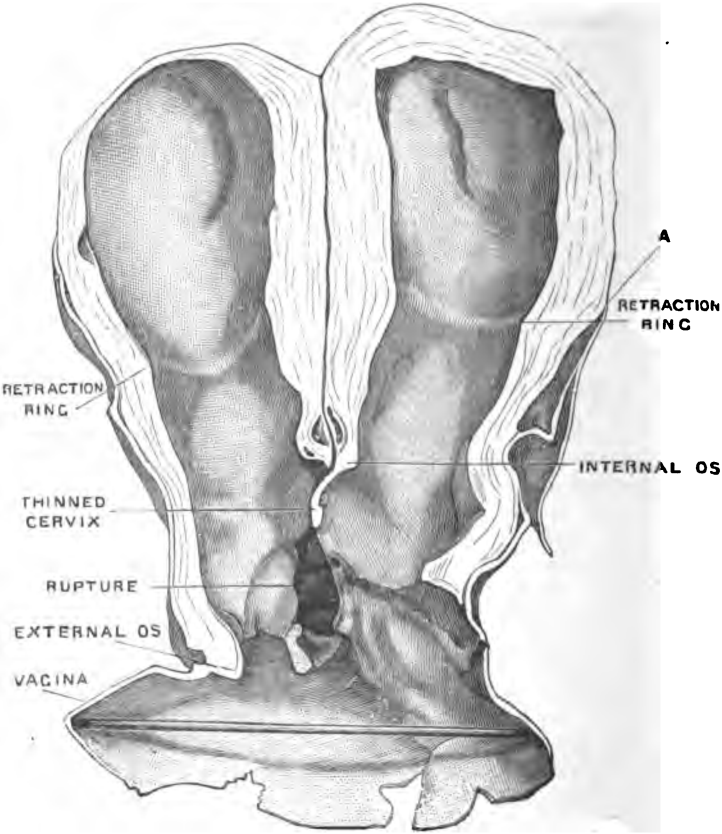

Fig. 114.—Ruptured Uterus showing Retraction Ring at Level of firm Attachment of Peritoneum; thinning of Cervix; gradual thinning of Lower Uterine Segment from Retraction Ring down to Os Internum. (*From a specimen in the London Hospital Museum.**)

A, Firm attachment of peritoneum.

in the generally-contracted pelvis, or in labour with a child of excessive size; for then the cervix may be

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* Photographs of a similar specimen by De Seigneux are published in the *Arch. f. Gyn.*, Band xlii.

nipped all around between the head and the pelvic wall, and thus held down. If this be the case, the stretching of the lower uterine segment will begin earlier and be greater, and the risk of rupture of the *uterus* will be greater. But there will be no risk whatever, with this state of things, of rupture of the *vagina*, except by the extension of the tear in the uterus.

Modes of vaginal rupture.—When the child lies transversely the presenting part does not fit the pelvic brim so accurately as to hold down the cervix. Hence, as the upper part of the uterus contracts, the cervix is not only stretched and thinned, but pulled up, and thus the vagina is put on the stretch. As in most transverse presentations the head lies in one iliac fossa and the breech lies higher up in the abdomen, the body of the uterus contracts around the breech and pulls the cervix and vagina up over the head. The part of the cervix and vagina that is thus made tense over the hard bulky head will be the part exposed to rupture; and in this case the *vagina* is as likely to give way as the *uterus*. Hence rupture of the vagina is comparatively common in transverse presentations.

When there is pendulous belly, especially when combined with contracted pelvis, so that the head does not enter the pelvis, the sinking forward of the uterus puts the posterior vaginal wall so greatly on the stretch, while the uterine contractions force the head against the stretched vagina, that rupture of the vagina may take place. This mechanism was first described by Osiander.

Rupture by injudicious treatment.—If in a case such as that above described—the upper part of the uterus firmly contracted around the child, the cervix and vagina thinned and tense—you try to do internal version, you will very likely rupture the uterus, either by the direct pressure of your knuckles against the uterine wall or by forcing a projecting part of the child through the thin cervix or vagina.

The formation of the ring of Bandl is, therefore, a contra-indication to version, or to bringing down a leg in an arrested breech labour.

Direction of rupture.—Rupture of the uterus takes place transversely to the line of greatest tension. When the cervix is held down in a contracted pelvis the tension is longitudinal and the rupture transverse. If it is made tense over the fœtal head in an iliac fossa, the tension may be greatest either in the length or the breadth of the cervix, and the rupture consequently either longitudinal or transverse. But these statements only apply to the beginning of the rupture. When the uterus has once given way the tear quickly extends; and the direction and extent of the rent depend partly on the relative resistance of the parts in the way of the extension of the tear, partly on the size and shape of the part of the fœtus that protrudes through the gap. A tear beginning in the cervix may extend down into the vagina or up into the contracted body of the uterus, either longitudinally or obliquely, or it may extend around the cervix and nearly sever the uterus in half.

Complete and incomplete rupture.—The tear may extend through both muscular tissue and peritoneum. This is called *complete* rupture. The tear may go through the muscular tissue and not through the peritoneum. This is called *incomplete* rupture. Incomplete rupture is likely to happen if the tear is at the side of the uterus, because here the peritoneum over the lower uterine segment is separated from the uterus by very loose cellular tissue, continuous with that of the broad ligaments. When rupture takes place here, blood is poured out into this cellular tissue, and then into that of the broad ligaments, raising the peritoneum and stripping it up from the uterus.

Rupture of the peritoneum without the muscular tissue may also occur, and has proved fatal both from hæmorrhage, and from peritonitis. But we know nothing about either the causes or the symptoms of this rare form of rupture.

Rupture from disease of cervix.—Rupture of the uterus may take place not from bony obstruction, but from disease of the cervix, such as cancer, cicatricial stenosis, fibroids, etc., which prevents its dilating, and so produces the same effects as the holding down of the cervix between the fœtal head and the pelvic wall. Such pathological rigidity of the cervix is very uncommon, and, therefore, rupture of this kind is rare.

Why rupture is more frequent in multiparæ.—Rupture of the uterus is more common in multiparæ than in primiparæ, for the following reasons. The degenerative changes which make the uterus prone to give way (although we do not know precisely what they are) occur, as we should expect, in uteri that have been often through pregnancy and labour. Malpositions of the head and malpresentations are more common, with contracted as well as with normal pelves, in multiparæ.

Production by ergot.—The commonest immediate cause of rupture of the uterus is the administration of ergot in obstructed labour. Ergot produces tonic contraction of the body of the uterus. If obstructed labour be left to itself, the conditions leading to rupture of the uterus, as a rule, develop so slowly that by the delay in delivery ample warning is given to the most ill-instructed accoucheur that there is serious hindrance. But ergot hurries on the catastrophe; so that if you give ergot in labour without ascertaining the size of the pelvis and that of the child, rupture of the uterus may be the first intimation that there is anything abnormal.

Symptoms.—The clinical history of most cases of rupture of the uterus is the following:—The pains follow one another faster and faster, till at length one pain follows its predecessor so quickly that there is little or no interval between them. If you examine the belly you feel the hard contracted uterus with a furrow running transversely or obliquely across it. If you were to watch the progress of the case you would find that as this furrow became deeper and more abrupt it rose higher and higher in the belly. (You should not wait to watch, but deliver without delay if this furrow is forming.) The hard, contracted uterus prevents you from feeling any fœtal parts. If the uterine contraction is still intermittent you will find that between the pains the part above the furrow becomes softer, while that below remains hard and tense, and is tender when handled. The patient's expression becomes anxious, her pulse quicker and smaller; her breathing hurried in proportion to the pulse, and shallow. Suddenly this state of things changes; the labour pains cease, and the patient, instead of straining with all her might, becomes collapsed. There is hæmorrhage from the vagina, but not enough to explain the patient's prostration. When you examine you find that the child is no longer pressed into or on to the pelvis, but either has receded or can be pushed back.

These symptoms are much the same, whether the rupture be complete or incomplete. When you examine the belly, if the rupture be complete you will feel the limbs of the child through the abdominal walls more easily than even in normal pregnancy. If it be incomplete you will feel a tense swelling rising out of the pelvis, but no distinct fœtal parts. Apart from this swelling, or the fœtal limbs, you will feel the hard, small, firmly-contracted uterine body.

When the child escapes into the peritoneal cavity the placenta may be retained in the uterus, or expelled into the peritoneal cavity after the child, or may escape by the vagina while the child is in the peritoneal cavity. Delivery of the placenta before the child, apart from placenta prævia, is so rare (though it has been reported) that it should always make you suspicious that the uterus has ruptured.

Events if not treated.—If after rupture the patient be left alone she will almost certainly die—either quickly, from shock; more slowly, from loss of blood; or, after two or three days, from peritonitis.

It has occasionally happened that the peritonitis has led to the fœtus becoming encapsuled in a cavity formed by adhesions among the bowels, and so the course of the case has come to resemble that of an extra-uterine pregnancy that has gone to term; but this termination is so rare that it cannot in the least be counted on.

Diagnosis.—The diagnosis of rupture of the uterus is not difficult. The stoppage of pains; the recession of the presenting part; the hæmorrhage; the prostration out of proportion to the hæmorrhage; are a combination of features not presented by anything else. The only difficulty is to distinguish between complete and incomplete rupture. The differential signs are these. If the rupture be incomplete, the child will not have completely receded; its presenting part will be still in the pelvic cavity, while the part which was contained in the body of the uterus will lie in a cavity formed by the pushing upwards of the peritoneum, and be surrounded by effused blood. Hence on abdominal examination you feel the contracted uterus, which will be of the size of a child's head, or that of a cricket ball (according to whether it contain the placenta or not), and by the side of it a swelling formed by the child covered by stretched peritoneum, the tension of which will prevent the outline of the child from being clearly made out; this swelling is not movable. If the rupture be complete the child's presenting part may or may not have completely receded, but part of the child, at least, will be free in the peritoneal cavity, where its outline can be felt with unusual distinctness, and it can easily be moved about. The contracted uterine body will be felt, as well as the child, but may be behind or at the side or in front of it. In incomplete rupture the uterine body is above and towards one side of the swelling formed by the child. You will see that, while in many cases of complete rupture there is no doubt about the diagnosis, there are a few in which it may be difficult to be certain that the rupture is complete.

Subcutaneous emphysema of the lower abdomen has been noticed both in incomplete and complete rupture. It has been said to be pathognomonic. There is no need to trust to it, if it be.

Treatment.—This is of two kinds: (1) prophylactic, (2) curative The all-important treatment of rupture of the uterus is the *prophylactic.* I can only briefly repeat here what I have more fully said in former chapters. When obstructed labour has lasted long, when the uterus is in a state of tonic contraction, and when the ring of Bandl is felt high up, *immediate delivery* is absolutely necessary. If the head is presenting in a favourable position, the child alive, and the pelvis not so contracted as to negative the possibility of forceps delivery, try to deliver with forceps, but do not protract such attempts. If the child be dead, or if you cannot deliver quickly with forceps, perforate. If the child be in a transverse position do not try to turn: decapitate. If in a breech position, use the blunt hook, and if with this you cannot get it down, perforate the abdomen. At all risks to the child, deliver quickly.

It has been above stated that there are certain cases in which rupture of the uterus takes place in easy labour, or even in pregnancy. As we know nothing about the causes of such ruptures we cannot prevent them. But except these, which are very rare, every case of rupture of the uterus ought to be prevented: rupture from obstructed labour occurs either because the patient has not had a competent medical attendant, or has not allowed him to treat her properly. It follows from this that it is exceptional for rupture of the uterus to occur in well-officered lying-in hospitals, or in private patients whose means enable them to have the best attendance. Rupture of the uterus occurs among those liable to be neglected, and usually in circumstances unfavourable to the carrying out of the best treatment.

After rupture has occurred the treatment required has three objects:

1. To extract the child and placenta.
2. To make the rent and its neighbourhood quite clean.
3. Either (*a*) to close the rent accurately by stitching, or (*b*) to provide for the escape of discharge from it.

How best to effect these objects depends on the circumstances of the case.

1. **Extraction of child and placenta.**—The child may be extracted either (*a*) through the vagina, or (*b*) by an opening in the anterior abdominal wall. Your choice depends on the situation of the child. (*a*) If its presenting part is still in the vagina, and only a part of it is in the peritoneal cavity, or if you think the rupture incomplete, deliver the child by the vagina. There is no advantage in making two wounds instead of one. The obstruction which led to the rupture will prevent you from delivering without lessening the bulk of the child, and as the child is almost certainly dead, do this at once, in the way called for by the case. If the head be presenting, perforate; if the shoulder, decapitate; if the breech, pull it down with a blunt hook, and, if necessary, perforate the abdomen, and afterwards the head. After delivering the child, use the cord as a guide to the placenta, and if the placenta be outside the uterus, use the cord to pull it down gently.

(*b*) If the child has been expelled into the abdominal cavity, so that you must pass your hand through the wound and hunt among the bowels to get hold of its foot, it is better to open the abdomen. If you deliver through the wound in the genital canal you may enlarge the wound, and so cause fresh hæmorrhage. You may damage the viscera in searching for the foot, and in pulling down the child you may pull down, and perhaps tear, coils of bowel. Open the abdomen in the same way as for Cæsarian section. You can then see what you are doing. Grasp the child by the foot and extract it; and then remove the placenta.

2. **Cleaning the rent.**—The next thing is to clean the parts. Much blood has been effused: the wound surface and peritoneum have perhaps been smeared with *vernix caseosa* or meconium. Clean the parts by liberal washing with clean water a little hotter than the temperature of the body: from 100° to 104°. If the child has been extracted by the vagina, wash the parts with a syringe or douche-tin. Move the nozzle of the syringe throughout the whole length of the rent, and pass it through the rent into the peritoneum. Hold the perineum back with the fingers while doing this, that the fluid, with dislodged clots, may have no difficulty in returning. To wash thoroughly, plenty of fluid must be used; and it is not safe to use any poisonous germicide in large quantity. It is essential also that treatment should be prompt; and it is better to wash the parts immediately with plenty of plain water than to wait to get a non-poisonous germicide, or absolutely sterilised water, and use that in limited quantity. Ordinary water from the tap *may* contain germs of disease: but the chances against it are millions to one. If you have extracted by the abdomen, wash out the peritoneum by pouring water into it from a jug.

3. Having made the parts as clean as possible, now decide either for (*a*) suture, (*b*) drainage.

Suture of the rent.—(*a*) Suture is only possible from the abdomen. The peritoneal margins of the rent must be sewn together accurately along the whole length of the tear. If there are gaps in the stitching where the peritoneal edges are not brought into apposition, the suture might as well not have been put in at all. You will see, therefore, that to suture a ruptured uterus must always be a tedious proceeding, requiring a good light, an expert assistant, and a skilled anæsthetist. Hence it is a mode of treatment that can seldom be carried out in the home of a poor patient. Further, if the rent be behind, extending down towards or into Douglas's pouch, suture will be a difficult thing, even with every advantage.

I think that, as a rule, suture of the rent is only advisable when the patient is in a hospital, and the tear on the anterior surface of the uterus.

The sutures should be similar to those employed in Cæsarian section; viz. deep sutures through the peritoneum and uterine muscle, not through the decidua, about two-thirds of an inch apart; and superficial sutures bringing the peritoneal edges together. The object of the suture is to get union of the peritoneal surfaces, so that the discharge from the ragged wound of muscular and cellular tissue may be shut off from the peritoneum.

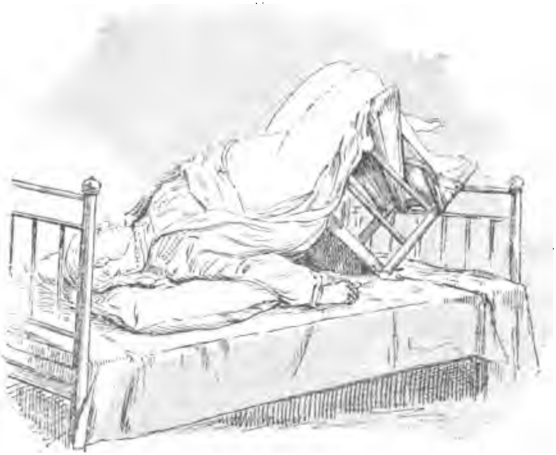

Fig. 115.—Showing extemporised raised Pelvis Position.

The suturing will be more easily done if the patient is put in the *raised pelvis position.* If the patient is lying flat, it may be possible to see the uterine wound well, but it may be found that intestines bulge forward and have to be held back, or they may be lying in the wound. In the raised pelvis position the intestines fall towards the diaphragm, so that the uterus can be seen. If there be no table at hand which will support the patient in this position, one can be extemporised by putting on the bed a chair resting on its top rail and the front of its seat, and pinning a towel over its legs. The patient is then placed on the back of the chair, her knees being supported by the towel. This position gives a better view of the parts concerned than can be got in any other way (Fig. 115).

Drainage.—(*b*) Supposing that, either from its position or from the circumstances, you do not think you can *accurately* sew up the peritoneal wound, it is better not to submit the patient to the prolonged anæsthesia and manipulation of the peritoneum which this delicate task involves. The next best thing is to secure drainage. Use either an indiarubber drainage tube or iodoform gauze. The indiarubber tube is the simpler. Put one end in the wound and let the tube conduct the discharge outside the body, either by way of the vagina or the abdominal wound. It is not necessary to drain both ways. Usually the vaginal route will be best. That way is best which best secures that the cavity in which the discharge is likely to collect has the end of the drainage tube in it.

Drainage by iodoform gauze is perhaps better, but it is more difficult to apply. Pack the wound with a strip of gauze, not so tightly as to displace its margins, but sufficiently to ensure that the gauze may remain in contact with the whole surface of the wound. This done, bring the end of the gauze by the most convenient route, either the vaginal or that by the abdominal wound, to the surface. The threads of the gauze will, by capillary attraction, lead the discharge to the surface, and the iodoform will, if the wound has not been already infected with septic matter, prevent its getting infected. The gauze may be left in for a week or even more.

Porro's operation.—It has been advised to treat rupture of the uterus by Porro's operation. In rupture occurring in the body of the uterus it may be good practice to amputate the uterus at the cervix. The damaged part is thus got rid of, and a healthy stump left which can be treated in a surgical way. But it is not such a good practice as suturing the wound when possible. In a rupture involving the cervix and vagina, if you cut off the body of the uterus the wound in the cervix and vagina is not closed. It is left to granulate, and possibly infect the system. Porro's operation here seems to me a useless addition to the patient's danger. Its results in such cases have not been good.

Conditions which influence the result.—It is not possible at present to demonstrate by figures the superiority of any particular method of treating rupture of the uterus. For this reason I have often had to use the word "probably." The success of treatment depends on many other things besides the method which the operator has attempted to carry out: on the surroundings among which the patient is placed, the time at which the operation is done (if postponed for several hours the prognosis is worse), the condition of the patient, the skill of the operator, the after-treatment, etc. Hence statistical tables showing percentages of deaths after this or that treatment are of no value unless we know more about the cases compared than any tables that I know of tell us. In the foregoing I have described what seems to me the way likely to give the best results.*

The mortality of cases without other treatment than delivery by the vagina is about five out of six. Only about 6 or 7 per cent. of children survive. The modes of treatment I have described have lowered the mortality, but it is premature to say how much.

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* In a paper by Merz (*Arch. f. Gyn.*, Bd. xlv.), published after the above was in type, will be found a collection of cases, which strengthens the recommendations as to treatment that I have given.

CHAPTER XXI.

THE INJURIES TO THE GENITAL CANAL IN CHILDBIRTH.

Rupture and sloughing of the vagina.—A tear of the lower segment of the uterus may extend into the vagina; or the vagina may itself rupture so that the child escapes wholly or in part into the abdominal cavity. This kind of injury is described along with rupture of the uterus. A portion of the vaginal wall may be killed by pressure and may slough. The cervix may even be torn off all round like a ring. I have described how these injuries are caused in the chapter on the effects of contracted pelvis.

Tears of the vagina.—The mucous membrane of the vagina may be torn. Tears of this kind in natural delivery are very slight. Great tears are produced only by operative delivery; such tears have even been known to involve the ureter.

Their production.—Tearing of the vagina is believed to occur when the vagina is congenitally small and rigid, so that instead of stretching it gives way. Such abnormal fragility is most likely to be found in elderly primiparæ. It is more likely to happen with large children for an obvious reason. The posterior vaginal wall is more stretched than the anterior, hence tears are more often of the posterior than of the anterior wall. The lower part of the vagina is better supported than the upper, because the muscles and fasciæ of the pelvic floor are here attached to it. Hence tears of the vagina affect chiefly its upper part. If the vagina is narrowed by a cicatrix, this cicatrix is apt to be torn. But the great cause of extensive tearing of the vagina is forceps delivery. This acts in two ways: First, the child is often suddenly dragged out, without giving the soft parts time to stretch. Then the vagina may be torn if the head is high up, just as the perineum is torn if the head is low down. Secondly, if you try to rotate the head, the effect is to raise slightly one edge of the forceps blade and press the other edge more strongly against the skull. The raised edge may cut the vagina. This may happen without any conscious attempt at turning the head round, simply from not holding the forceps in such a manner as to keep the blades flat to the head.

Consequences.—These vaginal tears bleed, and so may make the hæmorrhage accompanying the third stage of labour a little more than it would have been; but they rarely cause great hæmorrhage. They offer an additional channel through which septic poison may get access, but this can be prevented by antiseptics. They generally heal by granulation, and thus make the lochial discharge more purulent and more prolonged than usual.

Treatment.—No special treatment is required unless there should be great bleeding, in which case the rent may need to be stitched up. Vaginal antiseptic injections during the lying-in will be beneficial, as preventing septic infection, keeping the discharge from becoming offensive, and hastening healing.

Injuries to the muscles and fasciæ.—Attention has been called lately to the importance of injuries to the levator ani muscle and the pelvic fascia during labour, as causes of prolapse after the puerperium. It is highly probable that rupture of fibres in these structures from over-stretching does take place, permanently weakening them, and so causing descent of the pelvic floor and womb. But the accounts hitherto given of these injuries are purely conjectural: they have never been verified by dissection. Therefore it is not necessary to do more than mention this view as a plausible conjecture.

Injuries to the vulva.—In first labours the fourchette is always torn; often the tear extends farther, and involves the perineum. As the head advances the parturient canal is dilated from above downwards: first the upper part of the vagina, then the perineal body and vaginal orifice, lastly the vulval orifice. The perineum is stretched both from before backwards and from side to side; at its greatest degree of stretching it may measure four or five inches from anus to fourchette.

Ruptures of perineum.—When the perineum is thus distended, its thin anterior edge is its weakest part, and, therefore, this is the part most often torn, and usually first torn. Beginning here, the tear extends back. How far back it goes depends partly upon the state of the tissues (whether they will more readily stretch or tear), partly upon the suddenness with which the dilating force is applied, and partly upon the magnitude of the dilatation required. The larger the head, the more suddenly it is driven through the vulval orifice, and the less distensible the tissues, the larger will be the perineal tear. When the tear extends beyond the fourchette into the perineal body it seldom keeps in the middle line, although the tear in the fourchette generally begins near the centre.

Central rupture.—That just described is the usual way in which the perineum is torn. There are less common modes. Sometimes the tear begins in the vagina, above the perineum, before the perineum is distended. Then the advancing head comes into the tear in the vagina, widens this, presses asunder the muscular and fibrous structures of the perineal body, and comes to bulge the skin in the middle of the perineum and finally to tear it: the tear beginning in the middle of the perineum, and extending from behind forwards to the fourchette, and from before backwards to the anus. This is called *central rupture of the perineum.* A child has been born through a central rupture of the perineum which did not involve the fourchette.

Rupture from above downwards.—There is another still rarer mode of rupture of the perineum that I have once seen. After the head had been delivered the hand protruded through the anus, and then the shoulder came down, tearing asunder the perineum from above downwards.

Unusual times of rupture.—The perineum is generally ruptured during the passage of the child's head. But not uncommonly, after the head has passed the perineum without damaging it, the shoulders cause it to give way. This is especially likely to happen when the child is very large, because the larger the child the larger is the size of the trunk in proportion to the head. The perineum has occasionally been torn during the introduction of the hand for some needful manipulation, before the child has come down upon it at all.

Complete and incomplete rupture.—From a practical point of view there are two kinds of rupture of the perineum, no matter how produced—viz. complete and incomplete. Complete rupture is that which goes through the sphincter ani. These cases do not usually heal in the lying-in period, unless they are carefully sewn up, because the fibres of the torn sphincter contract and pull asunder the torn ends. The result is that the patient cannot retain her fæces. But occasionally, if the patient be kept with her legs tied together during the lying-in and the parts are kept clean, even a complete rupture will spontaneously heal. A central rupture in which neither fourchette nor sphincter ani is involved might be expected to heal without trouble.

Incomplete rupture of the perineum is that which does not involve the sphincter ani. These tears will generally heal throughout the greater part of their extent if the patient be kept clean and with her legs tied together. If union of the sides of the tear is not perfect, the only result is that the vaginal orifice remains enlarged. Rupture of the perineum, complete or incomplete, does not cause prolapse. But as the injuries to the pelvic floor which commonly cause prolapse are, like rupture of the perineum, produced in childbirth, rupture of the perineum and prolapse are often found together.

It is not possible to give any figures which would correctly represent the frequency of rupture of the perineum. Slight ruptures occur in the majority of labours. The frequency of complete ruptures very much depends upon the management of labour. An accoucheur who makes a practice of quickly delivering his patients either with forceps or by giving ergot, will probably frequently meet with complete rupture of the perineum.

Treatment.—This is twofold—preventive and curative. 1. *Preventive.*—It has been pointed out that in the production of rupture of the perineum there are three factors. (1) The readiness of the tissues to tear and their indisposition to stretch. This we cannot alter. It is sometimes recommended to lubricate the perineum, but in what way the application of grease to the epithelium can alter the structure of the muscles and fasciæ beneath I fail to perceive. There is no evidence that lubrication does good, but only the opinion of those who use it to the effect that sometimes a perineum is saved which would have been torn had it not been anointed. As it is not possible to foretell the occurrence or the extent of a perineal rupture, this opinion is not based on any substantial ground. But it is perfectly harmless to grease the perineum, so you need not be afraid of doing it. (2) The size of the child. This, if the child is to be delivered alive, you cannot alter. (3) The speed with which the child comes through the passage. This is the one factor over which you have control. The only way of preventing rupture of the perineum is by regulating this, by taking care that the perineum is not too suddenly stretched, but is given time to dilate. If you are extracting with forceps, or helping the birth of the shoulders by pulling on the head, take care to extract slowly. If the head is being driven through by powerful uterine action aided by the mother's downbearing efforts, tell the mother to leave off straining, while you press on the head so as to retard its progress. The severity of the pain which distension of the vulva causes is a safeguard against injury, for it leads the patient to cry out, and in doing so to desist from expulsive effort.

Various plans have been devised to lessen the tension of the perineum. One is to press the sides of the perineum towards the centre. Try to do this when the perineum is tense: you will find your fingers simply slip over the skin without altering its position in the least. The same remark applies to the advice to press the hinder part of the perineum forwards. Putting the finger in the rectum to press the anus forwards is injurious (for you may injure the rectum), and does no good, for the perineum must, whatever its position, dilate enough to let the greatest circumference of the head pass. Pressure directly on the perineum was the plan recommended by the older accoucheurs; and in so far as this pressure retarded the too rapid advance of the head it may have done good. But I can imagine no other beneficial effect from this practice. Suppose a trouser so tight that the knee could not be bent without tearing it, would pressure on the knee prevent the tearing?

2. *Curative.*—The proper treatment of ruptured perineum is to sew it up without delay. It is true that many cases of incomplete rupture, and a few of complete rupture, will heal without stitches, and that it is difficult for an accoucheur single-handed to accurately sew up an extensive rent. But the stitches can do no harm. If the perineum is badly stitched, the patient is no worse off than if it were not stitched at all; and if well stitched, the patient will be saved a great deal of future annoyance.

Put the patient on her back and administer ether or chloroform. You cannot in any other position see what you are about, or bring the sides of the rent accurately together. When the patient is under the influence of the anæsthetic, have the thighs bent up and held apart, and then with pieces of wool soaked in 1 in 2,000 sublimate solution thoroughly cleanse the rent, opening it out so that you may see its full extent.

Incomplete rupture.—If the tear is incomplete, the best suture material is catgut. The advantage of this is that you have not the trouble of taking out the stitches, but can leave them to be absorbed. No. 1 chromicised gut is most suitable. Half-curved needles, No. 6, are best (Fig. 116). Full-curved needles are apt to break in the holder. For the operation in these circumstances the ordinary needle-holder (Fig. 117) is better than Hagedorn's, because with it you can put the needle at any angle to the holder that you wish. It is not necessary to trim the ragged surface of the rent; it is better not to, for if you do, the part will bleed, and this will prevent you from seeing well what you are about.

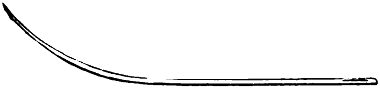

Fig. 116.—Half-curved Needle.

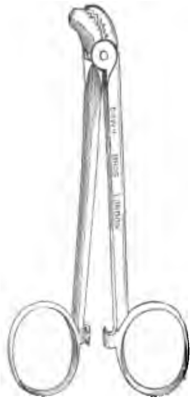

Fig. 117.—Needle-holder.

Enter the needle through the skin of the perineum as close as you can to the raw surface. Dip its point as deeply as you can, so as to take up a good bundle of the torn tissues. If you enter it on the torn surface instead of through the skin you may find it cut through the tissues. If you enter it through the skin too far from the raw surface you will get a fold of skin tucked in which will prevent healing. Aim at bringing it out through the vaginal mucous membrane, as close as you can to the edge of the raw surface. In the same manner enter it at the edge of the vaginal mucous membrane on the opposite side, and bring it out through the skin. Begin your suture at the very bottom of the rent. Tie each suture before you put it in the next. Cleanse with the sublimate solution the raw surfaces before you tie each stitch. Put in the stitches about one-third of an inch from one another. After tying each stitch cut the ends short. If you use stitches of any other material than catgut, leave the ends an inch or more long: they are then less likely to prick skin or mucous membrane, and are more easily removed.

Complete rupture.—Operation here is more difficult, as well as more important. Should there be any imperfection in your suturing with catgut, the operation will be a failure. Therefore it is well to have the additional security of a strong deep suture which will not be absorbed. Take a curved needle set in a handle, of size according to the extent to which the recto-vaginal septum is torn. Enter it about half an inch from the raw surface, through the skin in a line with the recto-vaginal septum. Put one finger in the rectum and another in the vagina: and guided by them, pass the needle through the recto-vaginal septum, above the top of the rent, and bring it out through the skin at a corresponding point on the opposite side. When the point has emerged, thread the needle with silkworm gut, and withdraw it. Leave the silkworm gut in position until you have united the raw surfaces with catgut. Enter catgut stitches beginning at the apex of the rent, first in the mucous membrane of the rectum, as close to the raw surface as possible. Take up as much of the torn tissue as you can, and let the needle emerge through the vaginal mucous membrane, close to the raw surface. Enter it again through the vaginal mucous membrane on the opposite side, and bring it out through the rectal mucous membrane. Tie it, and then put in the next stitch. When you have got the recto-vaginal septum sutured, the condition is as in an incomplete rupture, and you complete the suture as described for that condition. When all your catgut stitches have been tied, cut the ends short. Now tie the silkworm gut suture, pulling it tight enough to give substantial support, but not to cut into the tissues. Leave the ends of this about an inch long. Remove it at the end of a week. Tie the patient's legs together, and let the nurse wash out the rectum night and morning every day with warm water.

Rupture of vessels without external wound: labial hæmatoma.—Sometimes a vein in the vagina or vulva is ruptured without any external wound; and a great effusion of blood into the cellular tissue is the result.

Causes.—Rupture of pudendal veins, in the non-pregnant state, only results from violence. But in pregnancy, the veins returning the blood from the genital organs are so enlarged, and so prone to varicosity, that a vein sometimes bursts without any cause that the patient knows of. Such rupture takes place either at the end of pregnancy or during labour.

The pressure of the child's head accounts for such rupture during the second stage of labour. Rupture before labour, or before the head has entered the pelvis, without violence, can, in my opinion, only be accounted for by the degenerative changes which accompany the varicose condition. Careful observers (such as McClintock), have found that labial hæmatoma is not usually met with in patients known to suffer badly from varicose veins; and it occurs most often in first pregnancies, while large varicose veins are seen in women who have had many children. The explanation probably is, first, that women who know they have varicose veins are more likely to keep recumbent than those who are not aware of it; and secondly, that chronic varicosity of the veins recurring in successive pregnancies brings with it thickening of their coats which will tend to protect them from rupture. The largest varicosities are in the veins which are lowest down, because (in the upright position) they sustain the greatest pressure. Hence these spontaneous ruptures affect veins low down, below the deep pelvic fascia. Therefore the blood poured out travels downwards into the labium, and not upwards towards the peritoneum. The only cases that concern us here are those in which the rupture takes place during labour, and the resulting hæmorrhage is large.

Symptoms.—These are pain, shock, and swelling of the labium. The pain comes from the stretching of the tissues by the effused blood: it is sudden in onset, and severe. The shock is produced by the loss of blood (for the blood is as much withdrawn from the circulation as if it escaped externally) together with the pain, and therefore depends on the amount effused. Cases in which patients have died from the shock have been recorded. There is swelling of the labium which may quite block the vulval orifice, and thus obstruct delivery. The swelling is deep purple, almost black in colour. It is firm, elastic, but not fluctuating, for by the time the swelling has become large the blood has coagulated. It is not at all reducible; which distinguishes it from a mass of varicose veins. Its colour, sudden formation, and absence of fluctuation, distinguish it from an abscess. It does not gurgle or give an impulse on coughing, so that you know it is not a hernia.

Treatment.—This depends upon the amount of obstruction to delivery. It is best to prevent a breach of the surface if possible. Therefore, if it be possible to deliver without diminishing the size of the tumour, do so. If it be so big that it is not possible for the child to pass it, the only treatment is to open it when the labour has passed into the second stage, turn out the clot and then deliver the child. The opening should be made through the skin, parallel with the long axis of the labium, so that the interior of the wound can be readily got at. If, after the child is born, there is bleeding from the cavity, pack it tightly with iodoform gauze, kept in position by a T bandage.

CHAPTER XXII.

HÆMORRHAGE BEFORE DELIVERY

1. ACCIDENTAL HÆMORRHAGE.

Hæmorrhage before delivery comes from one of three causes.

1. Separation of the placenta.
2. Disease of the cervix or vagina.
3. Injury.

The first cause, separation of the placenta, is the most important. Bleeding from the second cause is seldom great, and from the third cause is rare. Consider first these less important causes.

Hæmorrhage from disease of the passages.—Pregnancy may occur with cancer of the vulva, the vagina, or the cervix uteri. Such disease is usually at once detected by the finger; for it does not commonly cause hæmorrhage during pregnancy until the disease is so advanced that diagnosis is not difficult. Hæmorrhage may occur from an erosion—that is, a flat adenomatous growth—on the cervix; or from a mucous polypus (a stalked adenoma) or a fibroid of the cervix. These causes are important, because cases in which menstruation is said to have occurred during pregnancy are most probably of this nature. The treatment of these diseases when associated with pregnancy does not fall within the scope of a work on "difficult labour," but it is needful to mention them among the causes of hæmorrhage.

Bleeding from injury.—During pregnancy the blood-vessels of the genital organs are enormously bigger. Hence if a pregnant woman near term is wounded in the genitals (as sometimes happens, for instance, from falling so that this part meets something sharp, or from sitting on a broken utensil) a large vein will probably be opened and the bleeding be terrific; it generally kills the patient before a doctor can be fetched. The way to stop such bleeding is, first, to place the patient recumbent, then press on the bleeding point with the fingers, clear away clots, and adjust a firm pad to keep up pressure on it. These cases are fortunately rare.

The usual kind of ante-partum hæmorrhage.—The great cause of ante-partum hæmorrhage is separation of the placenta. Cases of this kind of hæmorrhage were divided by Rigby into two classes, which he distinguished by the names of *accidental* and *unavoidable* hæmorrhage.

Definitions.—If the placenta is implanted, as it should be, on the upper or middle zone of the uterus, the child is, as a rule, born before the placenta is detached. In this case separation of the placenta is no necessary part of the process of delivery, but is an unfortunate accident, which we would prevent if we knew how. Hence hæmorrhage of this sort is called *accidental hæmorrhage.*

If the placenta is implanted over the lower segment of the uterus, the part which must expand and be changed from a hemisphere into a cylinder to let the child pass, it will be clear that the child cannot be born without separation of the placenta. Hence Rigby called this *unavoidable hæmorrhage.* The condition is *placenta prævia.*

Accidental hæmorrhage means hæmorrhage from uterine vessels opened by the detachment of a normally situated placenta (Fig. 118).

Etiology.—We know very little of the causes of such detachment: not enough to foretell or prevent its occurrence. Sometimes it follows, and therefore appears as if it were caused by, some *accident,* such as a fall, a blow, or a strain. But in many cases there is no such history: in many in which there is such a history the accident has been a very slight one, and in others the connection in time is not very close. J. Ramsbotham remarks: "The attack rarely follows the immediate application of a supposed cause; a lapse of some time usually intervenes." On the other hand, cases are known in which pregnant women have sustained very great violence without any detachment of placenta taking place. We do not know what are the causes which make the placenta in some women very easily detached, in others not so.

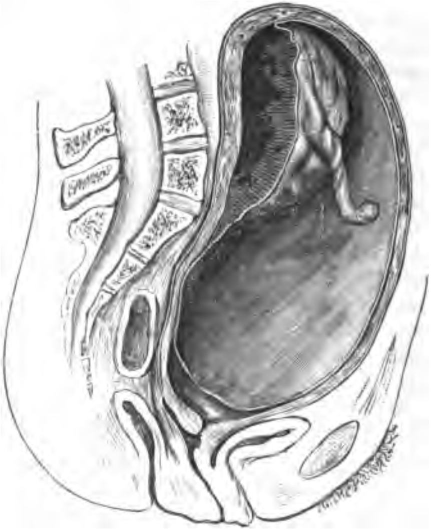

Fig. 118.—Accidental Hæmorrhage.

In some cases it has closely followed a strong *emotion*. Two theoretical explanations of this have been given. One is that the emotion causes a spasmodic contraction of some muscular fibres at the place where the placenta is attached, by which the utero-placental vessels at that spot are torn through. The other is that the emotion causes a flow of blood to the uterus, so that the sudden tension of the vessels bursts open one or more of them. Both these views are purely theoretical, for no one has ever seen or in any way proved either the spasmodic contraction or the afflux of blood. If they are accepted as sufficient for the time, in the absence of better knowledge, it must be admitted that we have no knowledge whatever why emotion, to which all women are liable, should cause hæmorrhage in only a few.

A very small hæmorrhage may, by the uterine contractions of pregnancy, become the cause of extensive detachment of the placenta and great hæmorrhage. When a vessel is torn a little blood escapes between the placenta and the uterine wall. When a uterine contraction comes on, and the placenta is compressed between the bag of waters and the uterine wall, the effect would be, if not counteracted, to squeeze out flat this little effusion of blood. If the utero-placental vessels surrounding the effusion are weak, the blood will be squeezed into a flat layer, will make its way between uterus and placenta, tearing through vessels in doing so, and then, when the uterus relaxes again, these newly-torn vessels will bleed, and thus a little bleeding becomes the cause of a great one. This explains why hæmorrhage does not always immediately follow what seems to have been its cause.

In some cases accidental hæmorrhage comes on during sleep. In such cases we cannot flatter ourselves that we have discovered its cause.

There is no doubt as to one fact—viz. that this kind of hæmorrhage is much commoner in women who have had many children than in those pregnant for the first time. This points strongly to the conclusion that the cause of the hæmorrhage will be found in conditions of the uterus, or of the system generally, produced by childbearing. The probability is that the chief cause of accidental hæmorrhage is *disease of the decidua.* But at present we do not know of any morbid change in the decidua which is special to accidental hæmorrhage, or which has even been frequently found with it.

Disease of the blood or blood-vessels may lead to hæmorrhage from the utero-placental blood-vessels, just as from blood-vessels anywhere else. There is no doubt that Bright's disease leads to hæmorrhages into the placenta. From this fact it is reasonable to expect that accidental hæmorrhage would be common in Bright's disease, but it has not yet been demonstrated that it is.

Other diseases which cause hæmorrhage elsewhere have been stated to cause accidental hæmorrhage from the placental site, such as small-pox, scarlet fever, acute atrophy of the liver, leukæmia. It is reasonable to expect that these conditions would do so, but they are such rare complications of pregnancy that their effect on it cannot yet be said to be proved.

Diagnosis.—When the bleeding is external, accidental hæmorrhage has to be distinguished from (*a*) bleeding due to disease or injury of the vulva, vagina, or cervix; and (*b*) placenta prævia. The former causes (*a*) will be perceived at any stage of the labour by examination of the cervix and vagina. Accidental hæmorrhage cannot be distinguished from placenta prævia until the os uteri will admit the finger. Then, instead of the rough spongy placenta, you feel the smooth membranes. The relation of pain to hæmorrhage is discussed in chapter XXIII.

Concealed accidental hæmorrhage.—If the attachment of the placenta to the uterus be firm, the blood may be confined within the placental area. It may push the placenta inwards, making it into a cup the hollow of which looks to the uterine wall, and bulge the uterine wall outwards, so as to make a boss that can be felt on the surface of the uterus.

But it is seldom that the placenta is attached so firmly that a local swelling of this sort is formed. Generally the blood breaks through at one part all the utero-placental vessels that are in its way, and escapes between the membranes and the uterine wall, separating the membranes and thus making its way to the os, and flowing out into the vagina.

In some cases the uterus does not contract strongly enough to force the blood towards the os, and the blood, therefore, may lie in considerable quantity between the membranes and the uterus, and not escape outside at all. It is possible that the membranes may be so firmly attached round the os uteri as to prevent the blood from flowing out. If labour has begun, the head may be so pressed down upon the cervix uteri as to prevent the blood from escaping outside. There is yet another possibility. The bleeding may bulge the membranes inwards so much, and put so much pressure upon them, that they may rupture and the bleeding take place into the cavity of the amnion. From these different causes bleeding may be copious and yet none of the blood escape outside. This is called *concealed accidental hæmorrhage.*

Diagnosis of concealed accidental hæmorrhage.—Here there may be either no flow of anything from the vagina, or, after the effused blood has coagulated in the uterus, the serum may gradually trickle out. But as no *blood* flows out the diagnosis may not at first be made. In a well-marked case it is not difficult. (1) The loss of blood blanches the patient. (2) Loss of blood makes the pulse small, quick, and weak. When a patient shows evident signs of great loss of blood, without any external hæmorrhage, you at once think that there must be internal bleeding. (3) The bleeding into the womb distends it. Hence the womb is larger than it was, it feels hard and tense, and it is rounded, because the spherical shape is that which holds most within a given compass, and therefore under tension the uterine cavity tends to become round. The uterus will yield to gradual stretching, as in twin pregnancy or dropsy of the amnion, but it does not tolerate sudden stretching. Therefore, (4) the tension of the womb causes great pain, often described as a continuous, stretching, tearing feeling; and this pain prostrates the patient to a degree even greater than the loss of blood would account for. These signs, the enlargement and hardness of the womb, and the pain in it, tell you that the bleeding is into the uterus.

Treatment.—Nature stops hæmorrhage from the placental site by (1) compression of the vessels by uterine contraction ; (2) clotting of the blood in the vessels, and organisation of the clot. As we cannot possibly get at the bleeding vessels in accidental hæmorrhage, what we have to do is to help the natural cure.

The amount of uterine contraction necessary to close the vessels and bring about thrombosis depends upon the size of the vessels. When the whole placenta is separated, as it is after labour, the vessels laid open are so large that nothing short of complete uterine retraction is enough to close them. But if, as is not very uncommon, only a few small vessels are torn across, the intermittent uterine contractions that go on during pregnancy may compress them enough to bring about thrombosis. The treatment of accidental hæmorrhage, therefore, depends first upon its amount.

Slight hæmorrhage.—If the amount of blood lost is trifling, the patient's pulse not notably quickened or her mucous membranes blanched, it will be enough to keep her for a few days recumbent. When the patient is lying down the circulation is slower and therefore the liability to renewal of the hæmorrhage less. Forbid alcohol, because it dilates the arteries and thus favours hæmorrhage. Give 5 grains of gallic acid three times a day, to contract the small vessels. Give with it half a fluid drachm of the liquid extract of ergot. This will make the uterus and its arteries contract, and uterine contraction is the natural means of stopping uterine hæmorrhage. If the patient is frightened and anxious about her condition, or of so active a temperament that you doubt if she will rest even though recumbent, give also gr. xv of sodium bromide to lessen reflex irritability. This mode of treatment is only safe if the hæmorrhage is trifling.

Great hæmorrhage.—If the hæmorrhage is copious the condition is highly dangerous and the patient is not safe till she has been delivered and the uterus is retracted afterwards. The treatment therefore is to get the uterus contracted, retracted, and emptied, as quickly as possible without injury.

1. **Before full term.**—The quickest way of reducing the size of the pregnant uterus, and thus enabling it to contract, is by rupturing the membranes. The disadvantage of this is, that we lose the bag of membranes as a dilator. But if the pregnancy has not reached term the child will be small, and, unless it be lying transversely, its head or breech will come down into the cervix and dilate it nearly as well as the bag of membranes, and much better than the larger and harder head at full term. The uterus can be further stimulated by the pressure of a binder tightly applied. When uterine retraction has begun, the best way of hastening it is by giving ergot. Ergot ought only to be given when it is quite certain that there is no obstruction; and in the case of premature delivery we may be generally certain that this is so. The period of pregnancy up to which it is proper to give ergot must be judged of, not by months, but by the size of the child. If the uterus, after the waters have escaped, does not reach higher than half-way between the umbilicus and the ensiform cartilage, and the head or breech present, it is quite safe to give ergot, unless there is great narrowing—either from pelvic deformity, tumour, or disease—of the pelvic canal. Ascertain first the position of the child, and if transverse correct it by abdominal manipulation.

In short, in accidental hæmorrhage occurring before the uterus reaches higher than half-way between the ensiform cartilage and umbilicus, see that the canal is not contracted, and that the child's long axis corresponds to that of the uterus. These conditions being present, rupture the membranes, put on a firm binder, and give ergot.

2. **At term; cervix not dilated.**—If the patient is nearer term and dilatation of the cervix has not begun, if you rupture the membranes the large hard head will be an inefficient dilator, and the first

stage of labour will be long. Dilate the cervix with Hegar's dilators, or the finger, till it will admit a finger. Then rupture the membranes. This will diminish the uterine contents, and allow the uterus to contract better. This done, put in Champetier de Ribes's bag, or Barnes's, if you have not the more recent and better instrument. This will supply the place of the bag of waters as a dilator, will take up less room, and by its pressure on the lower uterine segment will excite reflex uterine contraction. You thus get the advantages of rupture of membranes without the disadvantages. Put a strong binder over the uterus and fasten it as tightly as possible. Tell the nurse to tighten it if it gets loose. This will help to force the dilating bag into the cervix and may possibly press directly upon the part of the uterine wall in which run the bleeding vessels. When the dilatation is complete, stimulate the uterus to contract if necessary, and if uterine action be not strong enough to expel the child quickly, use forceps, pull on the breech, or bring down a foot, as the position of the child indicates.

3. **First stage in progress.**—The os may be dilated enough to admit two fingers. If so, perform bipolar version and bring down a foot. The half-breech will be a good dilator, and the letting off of the waters and bringing down of the leg will favour uterine contraction.

4. **Cervix dilated.**—The os uteri may be dilated to four-fifths of its full size. Rupture the membranes and apply forceps; or bring down a leg, according to the position of the child.

5. In **concealed accidental hæmorrhage** the first thing to be done is to relieve the excessive tension within the womb. Therefore separate the membranes as far round the os as your finger will reach, to help the escape of the blood which is probably between the membranes and the uterine wall, and then rupture the membranes. Then proceed as in accidental hæmorrhage of the ordinary kind.

Porro's operation.—It has been proposed to treat very bad cases of accidental hæmorrhage by Porro's operation. This of course stops the hæmorrhage. When the hæmorrhage is great, and the womb cannot be got to contract (for these are the cases that die), and the patient is so situated that all preparations can be made and efficient assistance had, this will be the best course. But not many lives are likely to be saved in this way, for Cæsarian section is an operation for which preparations have to be made; while the course of bad cases of accidental hæmorrhage is rapid.

Hæmorrhage in twin labours.—Accidental hæmorrhage may be caused mechanically in twin labours, from the diminution in size of the uterus following the birth of the first twin leading to such shrinking of the placental site as partly to detach the placenta. Such hæmorrhage is hardly ever in itself important, because when the passages have been dilated by the first child, the second can be quickly delivered, and hæmorrhage is stopped, or ceases to come under the term "accidental" hæmorrhage.

Plugging the vagina has been recommended for accidental hæmorrhage, as it has been for most kinds of hæmorrhage. The only way in which it does good is by irritating the cervix and so stimulating the uterus to contract. It is a clumsy and painful way of doing this. The remarks at page 315 on plugging for placenta prævia apply also to plugging for accidental hæmorrhage.

Liability to post-partum hæmorrhage.—In hæmorrhage *before* delivery, remember that the weakening of the patient by loss of blood makes it more likely that there will be post-partum hæmorrhage, and makes the patient less able to stand the effect even of moderate loss of blood after delivery. Therefore in any case of hæmorrhage before delivery be very careful to watch for and counteract the slightest tendency to post-partum hæmorrhage. Observe the condition of the uterus for at least an hour after delivery, kneading it the moment it seems inclined to become relaxed. Give ergot immediately after the child is born.

CHAPTER XXIII.

HÆMORRHAGE BEFORE DELIVERY.

2. Placenta Prævia.

Definitions.—The placenta is *prævia* when it lies over the lower segment of the uterus: that is, the part of the uterus which, before labour, is a hemisphere, and during labour becomes a cylinder. In protracted labour the distinction between the lower segment and the contracting part of the uterus becomes anatomically evident. Before labour there is no evident boundary.

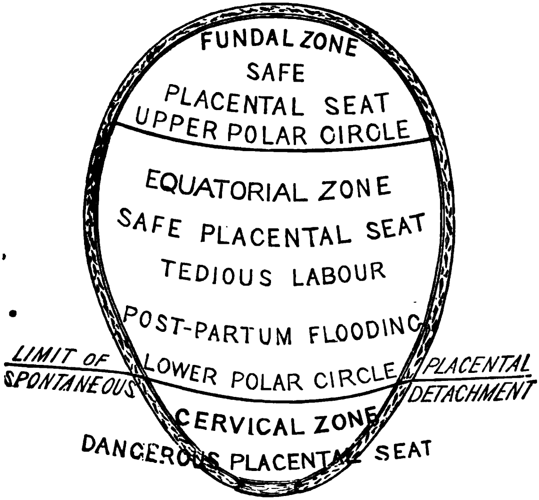

Fig. 119.—Diagram to show the "Dangerous" or "Cervical" Zone. (*After R. Barnes.*)

(This diagram is taken from Barnes without alteration: but I know of no foundation in fact for the statement it implies, that the implantation of the placenta on the "equatorial zone" is associated either with tedious labour or with post-partum flooding.)

R. Barnes has happily called the lower segment of the uterus, looked at as a site for the placenta, the "dangerous zone" (Fig. 119). This zone is roughly bounded by a circle, with the os internum as its centre, and a radius of about three inches measured along the cervix.

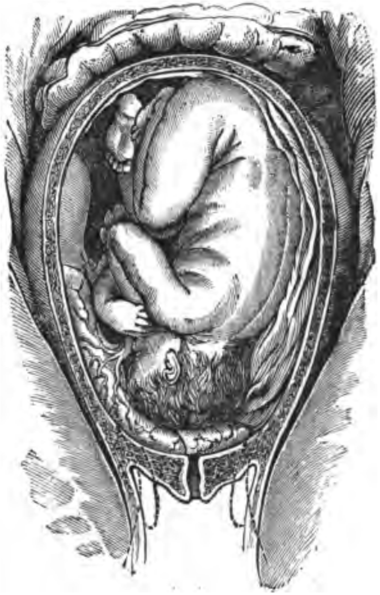

Fig. 120.—Placenta Prævia.

Central placental prœvia is when the placenta is so implanted that the finger in the os uteri feels placental tissue all round (Fig. 120).

Partial or *lateral placenta prœvia* is when the placenta covers the margin of the os at one part only, and elsewhere the finger comes into contact with the smooth membranes.

Marginal placenta prœvia is when the placenta does not cover the os uteri at all; but a part of the placenta is implanted on the lower uterine segment.

The placenta is never implanted on the cervix. A few cases have been reported in which the placenta has seemed to be attached to the cervix; but such an occurrence is so rare, and so opposed to physiology, that it is probable the supposed examples of it have been misinterpreted.

Etiology.—A. *Theory.* 1. When the ovum passes into the uterus from the Fallopian tube it ought to be received by the decidua at the upper part of the uterine cavity. If it is not, the ovum is carried by the flow of the secretions downwards, towards the internal os. If it gets caught on its way out by the decidua close to the os uteri, the decidua serotina will be formed at this point, and the placenta will be *prævia.*

This view is theoretical, because no one has ever seen what happens. But on this theory, it will be evident that there are two conditions which favour the production of placenta prævia. One is an imperfect decidua, so that the ovum is not received as it ought to be. The other is, abnormal uterine contraction, causing movement of the uterine contents, and thus moving the ovum about in utero.

2. Cases have been described in which the normally implanted ovum has been displaced from its attachment, but not separated; and has come to hang by a stalk of decidua serotina down towards the os uteri, and project into the cervical canal; and at least one case has been described* which seems to show that an ovum so displaced may become attached to the uterus lower down, and there develop; the placenta, from its low site, becoming *prævia.*

3. Specimens have been shown which seem to support the following view.† If, from imperfect formation of the decidua at the top of the uterus, the chorionic villi inserted into the decidua serotina do

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* Müller, "Placenta Prævia," p. 160.

† See Kaltenbach, *Zeit. für Geb. und Gyn.*, Bd. xviii.

not adequately nourish the ovum, the villi at the opposite pole of the ovum, that corresponding to the decidua reflexa, may, instead of becoming atrophied, grow through the reflexa, and implant themselves on the decidua vera around the os uteri. Hence it has been proposed to adopt, as a definition of placenta prævia, placenta developed over the lower pole of the reflexa. But the specimens illustrating these two theories are too few as yet to be conclusive.

B. *Facts.*—Placenta prævia is met with about once in 1,000 cases. It is more common in multiparæ, and in the later years of the childbearing period. The inference is, that it is due to changes in the uterus produced by childbearing. It is said to be especially common in women in whom successive pregnancies have followed one another very quickly. The facts published in support of this statement are very few; but as women who have many children generally have them fast, it seems probably true. Repeated miscarriages, syphilis, leucorrhœa, lacerations of the cervix, over-exertion, mental and physical shocks, have all been enumerated among the causes of placenta prævia, but without any evidence. Enlargement of the uterine cavity has been said to produce it mechanically, by there being more room for the ovum to wander about, and so more risk of its getting into the wrong place. The diameter of the ovum is $\frac{1}{120}$ of an inch, whilst the capacity of the cavity of the unimpregnated uterus is from $\frac{1}{5}$ to $\frac{1}{3}$ of a cubic inch, so that there is plenty of room for the ovum to move about, even in the virgin uterus, and a cavity of double or triple the normal size cannot make much difference in this respect. A man can be drowned just as easily in eight feet of water as in eight hundred. Still, from the general fact that in multiparous women the uterus is often large, it is probable that enlargement of the uterine cavity is a frequent antecedent of placenta prævia. Placenta prævia is rare with twins: because the condition of the endometrium, which prevents the ovum from getting embedded in the proper place, will, if two ova enter the uterine cavity, probably lead to the escape of one of them altogether. Smoothness of the endometrium, so that the ovum does not get embedded, and loss of the ciliated epithelium, so that there is no longer any upward current preventing the ovum from travelling downwards, have been assigned as reasons; and with much plausibility, as these changes might be produced by endometritis. Cases have been published in which pregnancy with placenta prævia has followed measles, a disease which, when it occurs in an adult woman, is often attended with endometritis. The probability is that degeneration or inflammation of the endometrium is the great cause of placenta prævia; but at present we know nothing whatever about the morbid anatomy, or the symptoms, of the disease of the endometrium which produces placenta prævia; and therefore we can neither predict nor prevent this complication of labour.

Placenta prævia may occur more than once in the same patient; but there is no marked tendency for it to do so, and probably much can be done to prevent it during the lying-in by treatment directed towards ensuring complete involution.

Characters of the prævia placenta.—It is seldom exactly central. It is usually larger and thinner than the normal placenta. The reason is that the uterine decidua gets thinner as it nears the internal os. There is, therefore, less tissue in which the chorionic villi can find nutriment; and to compensate for this, the placenta spreads over a larger area. From the imperfection of the decidua it also results that the placental villi are often in groups or islands; there are sometimes gaps from which villi are absent, and thus the placenta may acquire an unusual shape, being lobed, or horse-shoe-shaped; and succenturiate placentæ are common. The placenta makes up in breadth what it lacks in thickness and closeness of texture.

The part of the placenta which lay over the os is often after delivery darker than the rest, from conditions like those that produce the caput succedaneum on the fœtal head. The part near the os is often the thinnest, because here the decidua is thinnest. White fibrous lumps, the remains of old clots, are very common in the prævia placenta. Adhesion of the prævia placenta is commoner than adhesion of normally situated placenta. Thickening of the decidua is common with placenta prævia; and is an indication of the part that change in the endometrium plays in its causation.

The effect of placenta prævia on the uterus.—In that part of the uterine wall where the placenta is attached the vessels are enormously developed. When this vascularity affects the lower segment of the uterus, it makes the dilatation slow and difficult, and therefore prolongs the first stage of labour. It also disturbs the polarity of the uterus, and thus makes the pains irregular and weak. From the bruising, and possibly tearing, of the veins in the lower segment which may take place in delivery, there is a special liability to uterine phlebitis after labour, and to pyæmia as its result; and therefore there is special need for care in regard to antisepsis.

Clinical history.—It is thought that in placenta prævia there is a tendency to early abortion, and it is said that such abortions occur without apparent cause, that the pain and hæmorrhage are very slight, and that the ovum is often expelled unbroken, owing to the ease with which the process takes place. This is only theory, because abortions in which it can be ascertained that the placenta was being formed over the lower pole of the ovum are very rare. But it is probably true; though the condition can hardly be called placenta prævia until the placenta has been formed. Most subjects of placenta prævia go through the first half of pregnancy without abnormal symptoms.

Hæmorrhage.—The great symptom is *hæmorrhage*, from the separation of the placenta. This usually begins about the seventh or eighth month; sometimes earlier, as might be expected if abortion from this cause be common. Bleeding may come on without pains or appreciable dilatation of the cervix, and be so great as either to cause death, or by its repetition to keep the patient very anæmic. It is the liability of the patient to hæmorrhage that makes placenta prævia so dangerous.

The more central the placenta, the earlier the hæmorrhage. Statistics show that the usual time for the first hæmorrhage in central placenta prævia is from the twenty-eighth to the thirty-sixth week; in lateral, after the thirty-second week.

When bleeding has once taken place it recurs irregularly until delivery. As a rule, the earlier the hæmorrhage the slighter it is, because the vessels laid open are smaller. The bleeding is stopped by thrombosis of the vessels; and the vessels so plugged do not bleed again; hence, when the next attack of hæmorrhage comes, there are fewer vessels to be laid open. If the hæmorrhage is postponed till the beginning of labour at term, it is usually great, because then, large vessels not previously thrombosed are laid open as the placenta becomes separated.

The hæmorrhage as a rule comes on suddenly, without warning. Sometimes there seems to be an exciting cause, such as some effort, or shock, or local violence; but this is exceptional. It generally ceases spontaneously.

Delivery may take place with slight hæmorrhage, and cases have even been recorded of delivery without hæmorrhage. The conditions which cause bleeding during delivery to be slight are: marginal insertion of placenta, adhesion of the placenta, death of the child before labour, and copious hæmorrhage during pregnancy leading to extensive thrombosis of vessels. Although the death of the child stops the circulation through the fœtal part of the placenta, and may be supposed to make the circulation through the maternal part less active, yet there is abundant evidence that the death of the child is no security against dangerous hæmorrhage.

Modes of production of the hæmorrhage.—There are two ways in which bleeding is caused in placenta prævia; (1) physiological, and (2) accidental. (1) Usually a few days before the patient feels labour pains, sometimes as much as two months before, the circular fibres surrounding the internal os are inhibited, and the longitudinal fibres of the body of the uterus pull up its lower segment, thereby opening the internal os, and making the cavity of the cervix a part of the uterine cavity. When this opening up of the internal os has taken place the lower pole of the bag of membranes sinks down, and lies on the external os, instead of on the internal os as it did before. For this sinking to take place there must be a separation of the decidua over a slight area. Now, if the placenta forms the lower pole of the bag, some of the placenta either must be separated or must stretch. The separation lays open uterine vessels and causes the bleeding. Separation of the placenta in this way is a physiological process. (2) When the placenta is low down the veins which return blood from it are under greater pressure than when the placenta is high up. Hence rupture of vessels is more likely to take place. A strain, a shock, contact, or increase in the blood pressure, may provoke hæmorrhage. Such bleeding may come (*a*) from the uterus, by detachment of placental villi, or (*b*) from the placenta, by vessels in the placenta giving way. These vessels are very thin-walled, and in the thin spread-out prævia placenta they are not mutually supported, as in the normal placenta. (The frequency of clots and white fibrous lumps, the remains of clots, in the prævia placenta has already been mentioned.) Bleeding taking place before the internal os has opened up is accidental.

Frequency of premature labour.—In placenta prævia premature labour is the rule. Not more than a third of the cases go to term. Labour usually follows hæmorrhage.

The pains.—As a rule, with placenta prævia the pains are weak. This is because (1) the implantation of the placenta on the lower uterine segment disturbs the polarity of the uterus; (2) the stimulus of the impact of the presenting part against the cervix is lacking, (*a*) because the placenta is interposed, (*b*) because transverse presentations are common; (3) the patient during the labour, if not before, is often exhausted by hæmorrhage. Labour goes on badly because, further, (4) as these labours are generally premature, the os internum is not dilated as it is prior to labour at term, but the whole cervical canal has to be opened up from above downwards; and (5) the lower pole of the ovum, formed by the placenta, does not advance into the os and dilate it so quickly as it should do. With weakness of pains there is often found irregularity of pains. It is not uncommon, when the resistance of the cervix has been overcome, for the pains to grow strong and rapidly end the labour. On the other hand, often when labour has begun with fairly good pains, after a time, when the patient has become exhausted from hæmorrhage they get weaker and cease

Malpresentations.—In placenta prævia the proportion of transverse presentations to those in which the long axis of the child occupies that of the uterus is about one to three—that is, transverse positions are about fifty times as frequent as in labours generally. The reasons for this are (1) that so many of the labours are premature; (2) the placenta fills up the lower uterine segment, and makes it less easy for the end of the fœtal ovoid to engage in the pelvis; (3) the contractile power of the uterus is impaired. Another explanation is also given—viz. that lateral placenta prævia takes up room on one side, and pushes the end of the fœtal ovoid over to the other side. If this were the chief reason, transverse presentations ought to be more frequent with lateral than with central placenta prævia; but the reverse is the case. The prævia placenta is so thin that it does not much alter the shape of the uterine cavity.

Production and arrest of hæmorrhage.—I have said that the hæmorrhage is produced by the separation of the placenta in the onward movement of the bag of membranes. It is not produced solely by the dilatation, because the placenta can stretch a little, and so follow the uterus in its expansion. But with the dilatation there goes onward movement of the bag of membranes. This first puts the villi round the os internum on the stretch, and then breaks them away from the uterus. The resistance to the breaking away of the placenta is greatest at the side where the placenta is largest and thickest. Hence it will be completely detached at the side where the smallest part of the placenta is situated, before the detachment is complete at the other side. In other words, the effect of the pains is to convert central placenta prævia into partial. When this has been done, if the head or breech of the child comes into the os uteri, and the pains are strong, the advancing part of the child presses on the bleeding vessels and stops the hæmorrhage. At the same time the separation of the placenta allows the uterus to retract, and by its retraction the muscular fibres compress the vessels. In these two ways bleeding is stopped, and when it is stopped the blood in the vessels clots, and thus the arrest of hæmorrhage becomes permanent.

Birth of placenta before the child.—A central placenta prævia is sometimes not converted into a lateral one. If the pains are strong, the placenta becomes tensely stretched before the advancing part of the child, and may be detached all round, and driven down before the child. Such cases, as Sir J. Simpson showed, usually do well. This is because strong pains are required for it, and cases with strong pains generally do well. Delivery of the placenta before the child may take place either prematurely or at full term, and with any position of the child. The child usually, but not invariably, follows quickly after the placenta. This mode of delivery is unfavourable to the child, because the separation of the placenta deprives it of oxygen. Three-fourths of the children so delivered are still-born.

Death during or soon after delivery.—A patient with placenta prævia is not out of danger as soon as she is delivered. When the patient is very prostrate, the effect of the sudden emptying of the uterus, in lowering the pressure within the abdomen, may be to withdraw blood from the brain and heart so as to cause fatal syncope. The most common mode of death with placenta prævia is by post-partum hæmorrhage. Bleeding, not more than that usual in the third stage of labour, may be enough to kill a patient much weakened by loss of blood before delivery. The danger is often increased by a doctor who acts on the pernicious maxim—"deliver as quickly as possible." One who has this in his mind drags out the uterus when the uterus is not acting, and then post-partum hæmorrhage kills the patient." Further, a patient in whom the hæmorrhage of the third stage has been stopped may yet, if she has been greatly exhausted, pass gradually into collapse and die, without further loss of blood.

Adherent placenta.—More or less placental adhesion (*i.é.* placenta needing to be stripped off by the fingers) is found in about one-fifth of all cases.

Dangers in the lying-in period.—It has been pointed out that with placenta prævia the lower uterine segment is more vascular and dilates badly. Hence greater injury than usual is inevitable during delivery; and injury means greater liability to inflammation. The patients are exhausted, and therefore less able to resist morbid influences. In pre-antiseptic times "puerperal fever" in its different forms occurred oftener after placenta prævia than after ordinary labours. There was plenty of dead tissue, such as fragments of placenta, etc., which were liable to decompose. Peritonitis was the most common form, then uterine phlebitis, pyæmia, then endometritis.

Entrance of air into vein.*—In separating the placenta air has been known to enter a vein and kill the patient.

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* See Kramer, *Zeit. für Geb. und Gyn.*, Bd. xiv.

Effects of loss of blood.—The anæmic condition of a patient after delivery with placenta prævia renders her especially liable to phlegmasia dolens, pulmonary embolism, and insanity.

Prognosis.—In placenta prævia the life of the mother and that of the child are antagonistic. Treatment to save the child imperils the mother, and what is best for the mother often leads to the child's death. Müller, writing in pre-antiseptic times, put the maternal mortality during and after labour at nearly 40 per cent., and that of the children at 64 per cent. But since the introduction of antiseptics, and the treatment taught by Dr. Braxton Hicks, the mortality of the mothers in cases properly treated, is not more than about 5 per cent., whilst that of the children has become at least 90 per cent.

Circumstances on which prognosis depends.—(1) The earlier the labour comes on the less is the danger, because the earlier the labour the less the hæmorrhage. (2) Central placenta prævia is more dangerous than lateral, and lateral than marginal: for the more nearly central the placenta, the earlier and the greater is the hæmorrhage, the greater the liability to malpresentations, the less efficient the uterine contractions. (3) The stronger the pains, the more quickly is the placenta separated, the more rapid is the labour, the sooner is hæmorrhage stopped, and the better are uterine retraction and contraction after delivery. From weak pains the reverse effects follow. (4) Malpresentations make the prognosis graver, because they delay delivery, and call for interference. (5) If the cervix is rigid the prognosis is worse; if it is soft and dilatable the reverse. (6) Any complication makes the prognosis worse, just as it would that of any other labour. The points upon which the prognosis for the child depends will be spoken of in connection with treatment.

Diagnosis.—It used to be said that placenta prævia could be distinguished from accidental hæmorrhage by the relation of the bleeding to the pains; that in placenta prævia the blood flowed *during* the pains, in accidental hæmorrhage *between* the pains. This is quite true as to the escape of blood from the vessels: for in placenta prævia the pains, by forcing down the ovum, tear across utero-placental vessels; while in accidental hæmorrhage uterine contractions compress the vessels, and so tend to stop hæmorrhage. But the distinction is of no *clinical* use: for in placenta prævia blood may flow into the vagina during the pains, and escape outside between them; and in accidental hæmorrhage, blood poured out while the uterus was relaxed, may be forced outside by the bearing-down effort accompanying a pain.

Abdominal palpation.—The diagnosis of placenta prævia has been made by abdominal palpation: the hands, when pressed into the pelvic brim, have detected below the presenting part of the child a thick mass.* As this has been done, it may be done again. But in most cases it cannot be done, because the placenta is thin and spread out, and does not form a lump that can be felt.

Vaginal examination.—In most cases the diagnosis of placenta prævia cannot be made till the cervical canal will admit the finger. Till then the condition can only be suspected. Physical characters of the cervix and lower uterine segment have been described from which placenta prævia may be suspected, but none definite enough to be useful. When the cervix admits the finger, either the smooth membranes or the spongy placenta is felt, and this settles the diagnosis. In lateral placenta prævia the edge of the placenta will be felt on one side only, and in marginal it will not be felt until the finger has been swept around the lower zone of the uterus.

Treatment.—I shall first review the different means for the treatment of placenta prævia, and then deduce rules for guidance in practice. The prognosis in placenta prævia is better the earlier labour comes on. This points out the first principle in treatment, viz. bring on labour as soon as diagnosis has been made.

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* See Spencer, Obst Trans., vol. xxxi.

A. **Rupture of membranes.**—This is done that by lessening the bulk of the uterine contents it may provoke uterine contraction, and enable the uterus to embrace the child more closely and drive the presenting part down upon the bleeding vessels. This is likely to succeed if—(1) there are good pains; (2) the presenting part is the head or breech; (3) the os uteri is dilated enough for the presenting part to enter it.

On the other hand, (1) if there be not good uterine action rupture of membranes may not provoke it, and in that case the benefit of the bag of waters will be lost and nothing gained; (2) if the presenting part be not the head or breach it will not press effectively on the bleeding part, and rupture of the membranes will only make turning difficult; (3) if the os uteri be small or rigid, rupture of the membranes deprives us of the natural and best dilating agent.

B. **Dilatation of the cervix.**—This has formed a part of almost every plan of treatment that has been proposed. It is usually necessary, because dilatation of the cervix must precede delivery, and in placenta prævia the lower uterine segment is vascular and dilates badly, and the pains which should dilate it are generally deficient or absent.

Different modes of dilatation have been advised—cutting with a bistoury; tearing, as in the "*accouchement forcé*"; stretching open with the fingers; gradual dilatation by tents or water-bags. Cutting and tearing are bad: they make unnecessary wounds, and add to the danger both of hæmorrhage at the time and of puerperal disease afterwards. Stretching open with the fingers, if done slowly and gently, is better. But it is difficult so to regulate the force employed as to dilate simply, without tearing. The best way of dilating is, when the os will not easily admit the finger, by sponge tents or Hegar's dilators; when the os will easily admit the finger, by a water-bag.

The dilatation by these agents is slow, gentle, and uniform. The tent and the bag at once dilate the cervix and plug it. Sponge tents are better than laminaria, because they dilate more quickly, and therefore sooner plug the cervix, and the force they exert, although not great, is enough. The risk of septic infection can be avoided by dipping the tent, before putting it in, in a 1 in 1,000 solution of corrosive sublimate in glycerine. The best form of water-bag is that of Champetier de Ribes (p. 429). This has the shape of an inverted cone, the apex of the cone being in the os internum. The base is of such a size that when it has passed through the os delivery can at once be effected. The dilating pressure of this instrument is gentle and uniform; it is an almost exact imitation of the natural bag of the membranes. Barnes's bags may be used, but they are inferior, for they involve repeated manipulations, and do not so well dilate the cervix. You may be called to treat a case when you have with you neither tents nor water-bag, and in such circumstances digital stretching of the cervix may be preferable to the delay involved in sending for the dilating instruments. Hegar's dilators are less convenient than tents, because they take up more room in the bag, and their use involves repeated manipulation. But with them the cervix can be rapidly dilated up to a size which will admit Champetier's bag.

C. The **"accouchement forcé,"** which is sometimes recommended, means the rapid forcing open (that is, tearing open) of the os with the hand, separation of the placenta, turning and rapid dragging away of the child, followed by the removal of the placenta. This is the most dangerous of all modes of treatment. Rigby cautioned against it. Müller rightly terms it a "murderous" practice. Statistics show that about half the cases so treated die; the usual cause of death being post-partum hæmorrhage.

D. **Turning,** first practised by Portal (1685), has long been recognised as good treatment. The advantage of turning is that the thigh is brought into the cervix uteri, and the breech presses on the bleeding part. The soft thigh dilates the cervix gently, and stimulates uterine action. The diminution in bulk of the uterine contents, from the withdrawal of one leg and the liquor amnii, helps the retraction of the uterus, by which hæmorrhage is stopped. Turning was not in former times very successful, because it was thought necessary to put the hand in the uterus to turn; and this belief led to either the hand being forced through the undilated cervix (*accouchement forcé*) or turning being postponed until the os would admit the hand, and such delay often led to great hæmorrhage; and it was the frequency of hæmorrhage while the os was dilating that drove some to prefer the *accouchement forcé*. But in recent times Dr. Braxton Hicks has taught the bipolar method of turning, by which you can turn as soon as the os uteri will admit two fingers. This method, combined with antiseptics, has brought the mortality down to about 5 per cent. The *accouchement forcé* gives the best result for the child. Early turning followed by slow extraction sacrifices the child, but saves the mother. The treatment best for the majority of cases of placenta prævia may be epitomised as follows: *Early turning, slow extraction, antiseptics.*

E. Simpson's method: Delivery of placenta first.—Sir J. Simpson recommended this method, on the ground that statistics of cases in which the placenta was first delivered showed better results than those in which this did not happen. The average mortality of placenta prævia at that time was about one in four; that of cases in which the placenta came first about one in fourteen. But he compiled these statistics mainly from cases in which the placenta was *naturally* delivered first. Now, these are all cases in which there were strong pains, and this is why the statistics are favourable. The practice of *artificially* delivering the placenta first has not been followed by good results. R. Barnes says it is impossible, because the finger cannot reach farther than over a circle of two inches' radius round the os. This is true in the beginning of labour, but when dilatation has gone on to some extent the finger can reach proportionately farther.

F. **Separation of the placenta.**—This practice was first introduced by Cohen, who advised separating the placenta on the side at which the smaller half was attached, thus converting a central into a lateral placenta prævia. R. Barnes carried it further, and advocated separation of the placenta all round, claiming for this that (1) a hindrance to dilatation is removed, (2) that often the bleeding stops. The statement that "often the bleeding stops" gives an impression of security against hæmorrhage that experience does not bear out. It is a most dangerous thing to leave a patient after the placenta has been separated, with the idea that hæmorrhage will not return. The separation of the placenta allows the lower pole of the ovum to advance into the os uteri, and thus helps dilatation and stimulates uterine contraction, and for this reason it is a good practice. But if pains with good uterine retraction do not come on, the danger of hæmorrhage is increased by separation of the placenta, in proportion to the area over which utero-placental vessels are laid open. In short, separation of the placenta only stops hæmorrhage in so far as it accelerates delivery.

G. **Perforation of the placenta.**—This, followed by podalic version, is one of the oldest methods of delivery. As a rule it is not desirable, for cases of placenta prævia so central that the edge can nowhere be reached are rare; and if the edge can be reached, it is much easier to rupture the membranes close to the placenta than to perforate the placenta. But if the placenta be so central that the edge cannot be got at, then the best thing is to push the fingers through the placenta. If the placenta be thick, it is not easy to perforate it; but it is generally thin. Perforation of the placenta means tearing across of placental vessels, and therefore lessening of the child's chance of life.

H. **The forceps** is only seldom suitable in placenta prævia. In partial placenta prævia, with the head presenting, the membranes ruptured, the os uteri dilated to four-fifths of its size, delivery with forceps will be the best practice. Care should be taken not to pass a blade between the placenta and the uterine wall.

I. **Plugging the vagina.**—About this there has been great difference of opinion. For the last hundred years some obstetric authorities have recommended it and others disapproved it. Most various materials have been advised—wool, lint, sponge, charpie, tow, linen, silk, etc.; and some have soaked these things in oil, albumen, vinegar, alum, iron, or tannin solution, etc. To expect to stop bleeding from the uterus by applying a drug to the vagina is absurd. The effect of the plug is mechanical. It is supposed to act in three ways: (1) By stopping up the vagina the blood is prevented from getting out; (2) by tightly packing the vagina the bleeding lower segment of the uterus is compressed between the plug and the presenting part of the child; (3) the pressure of the plug stimulates the uterus to contract. Except the last, these effects of the plug are so temporary as to be valueless. To stuff the vagina really tight is a difficult thing to do, and very painful to the patient. The vagina is capable of great distension. When it is plugged the tension of the vaginal walls presses the material of the plug closer together, so that it becomes smaller; and the vagina soon stretches, so that in a little while the plug, which at first seemed firm, becomes a slippery ball, past which blood easily flows, and which fits too loosely to compress the cervix. When the os is too small to allow delivery, plugging is invaluable; but you should plug *the cervix*, not the vagina. The thing to plug it with is a sponge tent or tents.

J. **Ergot.**—Uterine retraction and contraction are a prime necessity in placenta prævia, and therefore ergot should always be given unless contra-indicated.

As most placenta prævia labours are premature, there is seldom danger in giving ergot. The drawback to its usefulness is that in so many cases the contractile power of the uterus is exhausted and ergot will not act. Still, it does no harm to give it.

These being the methods at our disposal, how shall they be applied in practice? Consider the different stages of the case.

As to "temporising."—Hæmorrhage during pregnancy, coming from the body of the uterus, when the os uteri will not admit the finger, and not copious enough to affect the patient's health seriously, should be treated in the way that I have recommended (page 294) for slight accidental hæmorrhage. If the bleeding is so great as clearly to weaken the patient, whatever the site of the placenta, the pregnancy should be ended.

As soon as ever placenta prævia is found out, be the bleeding great or little, labour ought to be brought on. The patient is not safe from hæmorrhage until she is delivered. Some advise to temporise until the child is viable. But as the mortality among the children in cases of placenta prævia treated with due regard to the mother's safety is 90 per cent., the temporising practice exposes the mother to risk for a very small chance of saving a premature child, difficult to rear. Temporising consists in letting the case take its course, and not treating the hæmorrhage, for there is no treatment except delivery which will stop hæmorrhage in placenta prævia.

Before diagnosis.—Suppose that the patient is six months pregnant. Her pallor and the smallness of her pulse show that the hæmorrhage has been severe. The cervix uteri will not admit a finger, and you cannot tell whether the hæmorrhage is accidental or due to placenta prævia. But as it is clear that the patient cannot stand another such loss, pass a sound into the uterus, rupture the membranes and let off the liquor amnii, and then put a sponge tent into the cervix. Put the tent in sublimate glycerine 1 in 1,000, and get every part of its surface covered with the glycerine. Seize the anterior lip of the cervix with a volsella and pull it down. Give the volsella to an assistant to hold. Take the tent in a speculum forceps held in the right hand; put two fingers of the left hand up to the cervix; pass up the tent in the hollow between the two fingers to the os uteri; when its point is in the os, press it up as far as you can into the cervical canal with the fingers in the vagina. This will at once plug (thus to some extent restraining bleeding) and dilate the cervix. A sponge tent is more suitable than laminaria, because it expands more quickly.

Then give the patient ergot in doses of half a drachm every four hours. Probably labour pains will come on, and first the tent and then the uterine contents will be expelled. At this early period of pregnancy you need not trouble yourself about the position of the child, for it will be small enough to come through in any position. If, after the tent has expanded and the cervical canal will admit the finger, expulsive pains do not come on, perform bipolar version with one finger in the cervix until you get a foot over the os uteri, and then seize this foot with ovum forceps and draw it down through the os. If you find this manœuvre difficult, put two or three tents side by side into the cervical canal, and when they have further expanded the cervix, either pains will come on or you will be able to get the foot down.

After diagnosis.—Suppose that the patient is seven or eight months pregnant and there has been a great hæmorrhage. If you have put in a tent, as soon as the os will admit the finger you can make a diagnosis. If the placenta be prævia you will feel the spongy mass of the placenta lying over the os if it be central—at the side if partial or marginal. If you feel the placenta introduce the finger, and separate the placenta all round as far as the finger will reach. This will make the advance of the ovum easier, and so accelerate delivery.

Before considering what is to be done when the cervix will only admit one finger, take the easier case in which the cervix will admit two fingers.

Separate placenta and turn.—If the os uteri will easily admit two fingers, there is no doubt as to what is the best treatment. Put two fingers into the os and sweep them round between the placenta and the uterus, so as to separate the placenta all round as far as the fingers can reach. The fingers will reach about an inch and three quarters from the os uteri. Supposing that the os uteri is an inch and a half in diameter, the placenta will, when this has been done, have been separated over a circle about five inches in diameter. Now, as the placenta is generally more than five inches in diameter, and as in placenta prævia the placenta is more expanded than usual, the whole placenta will not have been separated when this has been done. If its centre is over the os uteri, its edge will not have been reached. But it is seldom so exactly central as this. Usually one edge is near the os uteri. In that case, by separating the placenta all round, you will at one side reach its edge and feel the smooth membranes, and through them you will be able to feel and identify the nearest part of the fœtus. Then, with the other hand outside and the two fingers inside, perform bipolar version (see chapter XXVI.), and turn the child so that a foot is brought within reach of the two fingers. Now rupture the membranes, seize the foot with the two fingers, and bring it down through the os uteri. Next, pass a noose of tape up, put it round the ankle of the foot which has been brought down, and leave the ends of the tape hanging out of the vagina. When this has been done the patient is safe from further hæmorrhage until the child has been born, for if there should be hæmorrhage you can stop it by pulling on the tape, which will drag the part of the child over the os uteri down upon the lower uterine segment, so as to stop hæmorrhage by its pressure. Do not pull the child down unless there be hæmorrhage, for it is better that the cervix should dilate slowly and naturally than be hastily forced open and probably torn. Leave delivery to nature as much as possible, and in most cases the uterine contractions will force the child down enough to stop hæmorrhage. But should uterine contraction fail and hæmorrhage come on, then resort to the means of stopping it which the noose round the foot gives you.

If the placenta be so central that, after it has been separated as far as the fingers will reach, yet you cannot anywhere feel the edge, push the fingers through the placenta, and then perform bipolar version and bring down the foot, as has been described. It is more difficult to push the fingers through the stringy mass of the placenta than through the membranes, and therefore perforation of the placenta is not to be done if it can be avoided.

Suppose that the os uteri will not admit two fingers; it must be dilated until it will. Put in two or three tents side by side; use Barnes's bags if the cervix will admit them; dilate the cervix with Hegar's dilators; or slowly and gently stretch open the cervical canal with the fingers.

Champetier's bag.—The foregoing is the practice that has been proved by experience to be good treatment in placenta prævia. The dilating bag of Champetier de Ribes seems to me to promise still better results. It has been used with success, but not yet often enough to enable me to say that experience has proved its advantage over other treatment in placenta prævia. The bag can be put in (if not made of too thick material) as soon as the os is big enough to admit the finger. If the edge of the placenta can be reached, the bag should be pushed through the membranes. If not, it should be pushed through the placenta into the amniotic cavity. When it is distended it forms a cone filling the lower segment of the uterus, and pressing all round on the placental site. If the bag excites uterine action, its pressure will dilate the cervix and at the same time stop hæmorrhage. If uterine action fails, pressure on the bleeding point can be maintained and dilatation effected by gentle pulling on the bag. Dilatation by the bag has the advantage that the bag can be put in before the cervix is dilated enough to allow bimanual version, and thus the manipulations—Barnes's bags, tents, Hegar's dilators, etc.—necessary to dilate up to the point of possible version are reduced. The risk to the child is also less, as the only danger to the child is from the early separation of part of the placenta; and in lateral or marginal cases this need not be very great. The danger from pressure on the cord in extraction is avoided, as the child can be quickly delivered when the bag has done its work.

CHAPTER XXIV.

HÆMORRHAGE AFTER DELIVERY.

Post-partum hæmorrhage.—The causes of post-partum hæmorrhage may be divided into three groups: one comprising the vast majority of cases; the other two a small minority.

These groups are:

Common: A. Imperfect contraction of the uterus.
Rare { B. Injury to the uterus.
Rare { C. Disease of the blood or blood-vessels.

A. **Hæmorrhage from imperfect uterine contraction.**—The imperfect uterine contraction that causes post-partum hæmorrhage is of two kinds.

1. That which is imperfect because the womb is not empty.
2. That which is imperfect because the nervous energy of the uterus is exhausted.

1. IMPERFECT CONTRACTION OF UTERUS BECAUSE IT IS NOT EMPTY.

Adhesion of placenta.—This was at one time thought to be more frequent than is now believed. Beginners often think that adhesion of the placenta is commoner than it really is, because (*a*) they fail to distinguish between retention of the placenta in the vagina, due to want of skill in pressing it out, and retention in the uterus; and (*b*) because, until they find out how rare adhesion is, they often, like many of the old accoucheurs, take mere slow separation of the placenta for retention by adhesions. With increasing skill in pressing out the placenta, and in recognising the diminution in size of the uterus which accompanies the expulsion of the placenta into the vagina, and increasing experience of the great differences between different cases of normal labour, you will come to learn that adhesion of the placenta is a rare thing.

Causes.—Adhesion of the placenta is caused by disease of the decidua, but we do not yet know enough about the decidual diseases that lead to adhesion of the placenta to be able to foretell or prevent such adhesion. Changes are sometimes seen in the placenta, which have been supposed to produce adhesion, viz. the attachment of the chorion within the edge of the placenta, so as to leave a margin of placenta outside the chorionic attachment (placenta marginata); the presence of old clots, more or less decolorised, in the placenta (placental infarcts): thickening of the decidua serotina; but definite changes in the placenta are not always present, nor when present are they always of the same kind; and similar changes are met with when the placenta is not adherent.

Effects.—If the placenta should be everywhere adherent, of course no bleeding can take place, for then no vessel can be opened. But such cases are infinitely rare: usually the adhesion is only partial. In that case the healthy part becomes separated, while the adherent part remains attached. The uterus therefore cannot expel the placenta, and cannot properly retract and contract. Hence there is bleeding.

When the adhesion of part of the placenta thus leads to the whole being retained in the uterus, the fact that the afterbirth is not expelled at once draws attention to the cause of the hæmorrhage.

But another course of events is possible. If only a small piece of the placenta is adherent, the mass of the placenta may be broken off from it and expelled. In that case the little adherent bit of placenta may prevent persistent uterine retraction, and post-partum hæmorrhage may be the result. But the uterine contraction that has driven out the bulk of the placenta may continue in spite of the retention of a bit. There will then not be excessive hæmorrhage at the time of labour and thus you may at the time overlook the retention of a small fragment of placenta, and only find it out when hæmorrhage occurring some hours, or it may be days, after delivery, obliges you to explore the uterus.

Succenturiate placentæ.—Sometimes a portion of placenta is separated from the rest by a part of the chorion destitute of villi. If the two parts are nearly of the same size, the placenta has been wrongly called a double placenta. If there is a small part and a large part, the large part is identified as the placenta and the small part is called a *placenta succenturiata.* There may be more than one such island of placenta separate from the main mass; as many as seven have been seen. The explanation of their occurrence which seems to me best supported by observation, is that the part bare of villi, which separates the succenturiate placenta from the rest, is a part the villi of which have been destroyed by hæmorrhage into them during pregnancy. The occurrence of succenturiate placentæ is clinically important, because one of these may be retained after the bulk of the placenta has been expelled, and may cause hæmorrhage. The retention of an adherent bit of placenta from which the main part has been broken off can be found out by examining the placenta, in which the gap left by the torn-off piece will be seen. But examination of the placenta will not reveal the retention of a succenturiate placenta, for then there will be no gap in the main mass. But a piece of chorion will be retained along with the islet of placenta, and therefore if you examine the membranes as well as the placenta, you will in such cases detect the retention of a piece of membrane. If, however, the chorion has been separated from the amnion during delivery and torn in extraction, it will be practically impossible, without putting the hand into the uterus, to be sure that there is not a succenturiate placenta, or even a bit of chorion, retained. Therefore, if called to a case in which a bit of placenta or membrane has been retained, do not think that the attendant during labour is necessarily to be blamed.

Retention of membrane in the uterus will, to an extent dependent on the size of the retained piece, prevent proper uterine retraction, and therefore cause post-partum hæmorrhage. If by the care of the attendant the uterus is made to retract and contract after delivery, notwithstanding the piece of membrane within it, secondary post-partum hæmorrhage is likely to occur later. The membrane, the retention of which gives trouble, is the chorion. The decidua is so thin and friable that its retention is of no consequence; and the amnion is so tough that the placenta generally pulls it away entire. Retention of chorion is favoured both by too early and by too late rupture of membranes. Too early rupture of the membranes prevents that separation of the chorion from the uterus which should take place as the bag of membranes moves on into the os. If rupture takes place abnormally late, the chorion may give way, the amnion move on through it, and the amnion and chorion become separated. It is believed that retention of chorion may be produced by endometritis, leading to too close adhesion between the decidua and chorion.

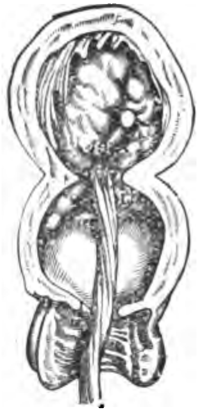

Fig. 121.—Hour-glass Contraction of the Uterus. (*After Tyler Smith.*)

Hour-glass contraction of the uterus* is a rare condition, in which the uterus seems to be divided into two cavities by a circle of contraction, so that its shape has been thought like that of an hour-glass. The upper cavity contains the placenta (Fig. 121). It is generally believed that the circle of contraction is identical with the retraction ring, or ring of Bandl. The part above this ring is prevented from complete

* For reports of well-observed cases see papers by Freund and Ahlfeld, *Zeit. für Geb. und Gyn.*, Bd. xvi.

contraction by the placenta within it (hence the late Dr. Matthews Duncan spoke of this condition as "hour-glass *relaxation*"); its lower boundary is contracted below the placenta; the cervix and possibly the lower segment of the uterus hang down loosely below the retraction ring. Cases have been described in which it was thought that the ring of retraction was too high up to be the internal os; but such cases, if they occur, are so rare that we know nothing about their production. The uterus in so-called hour-glass contraction is a uterus that is contracted but has not yet expelled the placenta. The theoretical explanation is that the circular fibres of the lower uterine segment, which ought to be inhibited during labour, are not inhibited; their contraction morbidly persists. We know nothing as to why inhibition is morbidly absent in these cases. The placenta may or may not be adherent. If it be not, then, if you wait, the placenta will be expelled. If it be adherent, this hour-glass condition will continue. The hæmorrhage is not so great as in atony of the uterus, nor is the uterine body completely relaxed; but, if the placenta be partly separated and not expelled, draining of blood will go on until the uterus is emptied and can contract and retract.

This condition is not difficult of diagnosis. You find that the uterus continues hard and large, and, half an hour or more after delivery, although the uterus is felt by the abdomen to contract, it does not diminish in size, and the placenta does not come away. Examine by the vagina and you will feel the cord passing through the firm ring of contraction.

If the patient has lost more blood than ought to be the case, it will not be wise to wait and see if the uterus will expel the placenta, although in most cases it will do this if time be given;* but the patient may in the meantime lose enough blood to make her convalescence slow, or even to cause death.

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* I saw a case once, with Dr. F. J. Reilly, in which the placenta was retained for several days in utero. While we were discussing arrangements for anæsthetising the patient and removing the placenta, it was spontaneously expelled.

The **treatment** is to pass the hand into the uterus, with the tips of the fingers pressed together so as to give the hand the shape of a cone. Grasp the body of the uterus with the other hand on the abdomen, and press it downwards and backwards. The object of such counter-pressure is (1) to push the cervix down within easier reach of the internal hand, and (2) to prevent the uterus from being torn away from the vagina. With this precaution, by steady, gentle pressure get the hand into the uterus, and press the tips of the fingers up between the uterus and placenta, breaking down any abnormal adhesion that may exist, until your fingers have reached the top of the placenta. Then hook the fingers over the upper edge of the placenta and bring it away. Aim at getting the placenta away entire if possible; for if you break the placenta the chance of leaving a small piece behind is increased.*

Treatment of adherent placenta.—Whenever it is inferred, from the slowness of its expulsion from the uterus, that the placenta is adherent, it should be removed in the way just described. Where there is no retraction ring to be dilated, its removal will be easier.

The cases which have just been considered are very important, because in them no treatment of the hæmorrhage is effective unless the cause is recognised; and removal of the cause usually stops the hæmorrhage.

2. IMPERFECT CONTRACTION OF UTERUS BECAUSE ITS CONTRACTILE ENERGY IS EXHAUSTED.

In these most terrible cases hæmorrhage occurs because the nervous energy of the uterus is enfeebled or exhausted, and not because there is anything retained. Here the patient's safety depends upon our success in exciting the nervous energy of the uterus, and keeping the flooding in abeyance until the uterus has recovered its tone.

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* I have once only met with a placenta so adherent that I could not remove it entire, but had to scrape it off and get it away in small fragments. The patient, thanks to antiseptic douches, got well.

The causes of uterine atony.—The surest way to *produce* post-partum hæmorrhage is to drag out the child or the placenta at a time when contraction is absent. Methods of hastening delivery—forceps, breech or foot traction—should only *assist* the action of the uterus, *never replace* it. Weak uterine contractions, not strong enough to expel the child within the usual limit of time, may be quite strong enough to expel the placenta and compress the uterine veins. But if the delay in delivery is due to "temporary passiveness,"—otherwise known as "secondary uterine inertia"—extraction of the child during this condition is almost certain to be followed by hæmorrhage, because uterine retraction and contraction are absent. In this condition there can be no necessity for hasty delivery, for damage from pressure cannot happen while the uterus is inactive.

The principle *not to deliver in the absence of uterine contraction* is the first point in the prevention of post-partum hæmorrhage. Do not pull away the placenta without waiting for uterine contraction. Give time for the proper detachment of the membranes, and look at them to see that the whole of the chorion has come away. If the placenta is squeezed or pulled out before the membranes are separated, a bit of chorion may be stripped off the amnion instead of off the uterus, and so be retained and afterwards cause hæmorrhage.* However natural the delivery of the placenta and membranes, it is important to see that the whole of the chorion is removed.

If due time is given for the natural separation and expulsion of the placenta and membranes from the uterus, it matters very little whether the placenta is pushed out of the vagina by pressure from above or pulled out by the cord. The advantage of the Dublin (otherwise called Credé's) method of delivering the placenta from the vagina is that it ensures the prompt discovery and treatment of failure of uterine action.

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* See Runge, *Med. Times and Gazette*, 1880, vol. ii. p. 598.

These two points—care not to extract the child or the placenta when the uterus is not contracting, and close supervision of the third stage of labour—are the chief precautions for the prevention of hæmorrhage.

Treatment.—The modes of stopping bleeding after labour may be divided into three groups, according to their principal aim, which is:—

1. To make the uterus contract.
2. To clot the blood.
3. To compress the bleeding veins.

In all cases first try to make the womb contract—in most you will succeed. Cases are fortunately rare in which the womb will not contract, and in which you have to do something else.

There are three ways of making the uterus contract, namely:—

1. Direct stimulation.
2. Indirect stimulation.
3. Drug stimulation.

1. **Direct stimulation.**—(*a*) *Knead the uterus with the hand outside.* Kneading the uterus through the abdominal wall comes first, because it is the method of treatment that can be adopted most quickly. Your hand is always ready, while everything else takes time to prepare. It is almost always successful for the time, and in the slighter cases its repetition at intervals is enough.

(*b*) *Hand inside.* But in some cases the response of the uterus to stimulation from outside is not lasting. Then pass your hand into the relaxed uterus. This not only stimulates the uterus, but by it you gain help in diagnosis and prevention. The business of the intra-uterine hand is to find out if there be anything in the womb which is causing the bleeding, such as retained placenta, membrane, clots, or a tumour, and, if there be, to remove it. If you have removed the cause, continued stimulation from outside will generally secure continuance of uterine contraction.

(*c*) *Injection of hot water.* But the contraction provoked by the contact of your hand with the inside of the womb may not last. The repeated introduction of your hand is undesirable. The next thing to be done is to inject hot water into the uterus. This directly provokes contraction, and does good in another way; it washes out loose clots, bits of membrane, etc., small enough to elude your hand, and yet better out of the uterus. It seems as if the hotter the water the greater the effect. Water in which you can bear to immerse your hand will not injure the tissues, although it may be a little hotter than the patient likes. Do not, therefore, if the case be urgent, lose time in taking the temperature of the water; your hand (not finger) is sensitive enough.

(*d*) *Cold water or ice.* Instead of hot water, cold or iced water may be used, or a lump of ice may be put inside the uterus or the vagina. But ice is not generally available when wanted, whilst hot water is always ready in the lying-in room, and, to an exhausted patient, warmth is more grateful than cold.

(*e*) *Electricity.* Electricity has been recommended, and doubtless a powerful current would stimulate the uterus as it does any other muscle. But even if you should have with you a battery, the time consumed in getting the electrodes fit for action will be better spent in using other and quicker ways of stopping the bleeding.

2. **Reflex stimulation.**—Two modes of reflex stimulation are in common use, which act through the nerves (*a*) of the *skin*, (*b*) of the *breast*. (*a*) Ice or cold wet napkins to the vulva, slapping the abdomen with a cold wet cloth, and pouring cold water on the abdomen, are familiar and old remedies. They cause reflex contractions of the uterus. But drenching with cold water makes the

patient uncomfortable, and depresses her strength, as Madame La Chapelle pointed out. The milder measure of a cold wet cloth is less objectionable, but it is not superior in effect to kneading the uterus with the hand. But if you are tired of kneading, or have to do something else with your hands, a cold wet cloth applied by the nurse may be a useful temporary substitute. (*b*) Putting the child to the breast is so harmless that this should always be done. But the time generally taken up in doing this prevents it from being of immediate use, although it is valuable as a means of keeping up the contractions procured by kneading the uterus.

3. **Drug stimulation.**—*Ergot.* There is one drug, and only one, which produces uterine contraction and retraction, and that is ergot. Other drugs have been advised, and good results reported from them, but there is none that approaches ergot in power. But in the worst cases we cannot wait for the absorption of ergot, for even when the drug or one of its derivatives is injected under the skin, there is still time for fatal hæmorrhage before its action on the uterine muscle begins; and the worst cases of hæmorrhage are those in which the contractile power of the uterus is exhausted, and then even ergot fails. Ergot is invaluable, but its chief uses are (*a*) as a prophylactic, given immediately after the birth of the child, and (*b*) after bleeding has stopped, to make tonic the contraction produced by other means.

Tonic spasms of the uterus without retraction.—There is a rare form of post-partum hæmorrhage, in which the body of the uterus becomes hard and rigid, but its cavity is not closed. There is spasm, but not retraction. This condition may follow the administration of ergot, but also occurs without it. There is continuous bleeding, which goes on until syncope is produced; then the spasm relaxes, and the bleeding can be stopped by the means of procuring uterine contraction, which I have just described. The treatment of the spasm is to anæthetise the patient quickly, in order to relax spasm.*

Treatment of exhaustion of contractile power.—The worst cases of post-partum hæmorrhage are those in which the contractile power of the uterus is exhausted, and no kind of stimulant will procure tonic contraction. We must here rely either on pressure, on blood-clotting, or on a combination of both.

Perchloride of iron.—The injection of perchloride of iron solution (1 in 6) stimulates the uterus to contract and clots the blood. It is the *clotting* that is valuable, for the stimulant effect can be got by other means. The cases in which the clotting is required are those in which the uterus has lost its contractile power; therefore you leave off trying to make it contract, and act directly on the blood. This treatment has been advocated by Robert Barnes.

The objections to it are, first, that it is *dangerous:*

(*a*) Death has occurred from pumping a quantity of fluid into the uterus; for the uterus will not tolerate sudden distension, although it will submit to gradual stretching. To avoid this, use a double-channelled tube, or put two fingers in the cervix with the tube between them. Either precaution lessens but does not remove the danger. Bleeding is still going on, the injection clots the blood, and the clots may be carried down by the reflux and stop up the channel for the back flow of fluid.

(*b*) A clot may be carried from a uterine vein into a pulmonary vein, plug it, and thus cause death. A clot formed artificially in a vessel with an open channel is quite a different thing from one naturally formed in a vessel the walls of which are firmly pressed together.

(*c*) The iron solution may run along the Fallopian tube into the peritoneal cavity and set up peritonitis. (The two latter accidents have not as yet occurred from the injection of iron for post-partum hæmorrhage, but they have resulted from its intra-uterine injection for hæmorrhage of other kinds.)

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* See Matthews Duncan, Obst. Trans., vol. xxix., p. 369; see also Gibbons, *Comptes Rendus, Congrès periodique internationale de Gynécologie et d'Obstétrique,* 1894; and Leahy, *Lancet,* August 3rd, 1895.

(*d*) If these immediate dangers are escaped, the uterus is not left in a physiological condition. It ought to be contracted and empty. It is left dilated and full of clot. This clot may decompose, and thus the patient has an additional chance of septicæmia.

Secondly, the injection of perchloride of iron is *not always successful.* In the St. Thomas's Hospital Reports, between 1872 and 1880, I find five failures recorded. Galabin * states that out of twelve cases in the Guy's Charity in which the ferric solution was used, five died. It may be urged that death does not always mean failure to arrest hæmorrhage, for the patient may have died from the loss of blood which had occurred before the treatment was used. But in a paper by Pollard † I find three cases in which hæmorrhage recurred after the iron had been injected. Two others are recorded in the Obstetrical Society's Transactions.‡ My conclusion is that although its effect is to check hæmorrhage, yet the injection of perchloride of iron is neither a safe nor a certain mode of treatment.

Plugging the uterus.—A new treatment has lately come from Germany—namely, plugging the uterus with iodoform gauze. It is claimed that by packing the uterus with gauze the flow of blood from the vessels is mechanically hindered, and that the presence of the gauze provokes energetic uterine contraction. It will be evident also that the threads of the gauze furnish a surface well adapted to provoke clotting of the blood. Its advocates say that the bleeding is stopped by the powerful contraction of the uterus on the gauze plug, which is a continuously acting stimulant. They say, further, that, if you have gauze with you, you are saved the trouble of exact diagnosis of the cause of bleeding, for gauze plugging is the best way of stopping hæmorrhage from lacerations of the canal (except in the case of tears of the vulva, which can be easily seen), and therefore in hæmorrhage of uncertain origin the best plan is to plug both vagina and uterus. Dührssen* (to whom we are indebted for this mode of treatment) recommends prophylactic plugging—that is, plugging as soon as there is a threatening of hæmorrhage instead of waiting for hœmorrhage to become serious. Granted that the uterus is to be plugged, there is no better way of doing it than with iodoform gauze.

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* "Midwifery," 1st edition, p. 691.

† *Brit. Med. Journal,* 1880, vol. i.

‡ Vol. xx.

Any treatment of post-partum hæmorrhage that is largely used in slight cases as a prophylactic will show a great percentage of lives apparently saved, for cases of dangerous hæmorrhage are rare. We must judge the effect of treatment of this hæmorrhage rather by the fewness of failures than by the number of apparent successes. Death from atonic hæmorrhage has taken place in spite of the plugging. The introduction of the gauze has a danger of its own. Sudden death has taken place from entrance of air into a uterine vein while the gauze was being put in. This treatment, therefore, is neither certain nor safe. It is, like the injection of a styptic, unphysiological, for the uterus cannot be completely contracted while the gauze is inside it.

Continuous compression.—If the uterus can be got to contract, and remains retracted and contracted, bleeding will stop. When the uterus responds by vigorous contraction, either to iron injection or to gauze packing, it will respond to other means. The worst cases are those in which nothing will procure tonic contraction. Here the only remedy is continuous compression.

The uterus is too large to be compressed by one hand. Various modes of compression have been advised. One is to press the uterus backwards, with your hand in front of it, so as to compress it between the hand and the spinal column. But the spine forms a convexity with a hollow on each side, and the uterus, when pressed back against it, is apt to slip to one side of the spine, into a place where it cannot be so well compressed. Another suggestion is to put your hand behind the uterus, and compress it between the symphysis pubis and the hand. Here the pressure of the symphysis is limited to a small area of the uterus.

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* *Sammlung klin. Vort.*, Leipzig, No. 347.

It has been advised to combine the two hands by putting one hand in the uterus and the other outside. This has been varied by substituting for the internal hand a dilated bag. Thus the uterus is compressed all round, within and without. But the objections to the use of iron to clot the blood and to plugging the uterus with gauze apply with greater force to this proposal. The uterus cannot contract properly with the hand or an inflated bag within it; and the procuring of uterine retraction and contraction must be the final aim of all your treatment, for by it alone can hæmorrhage be permanently stopped. You get by this means temporary compression at the expense of hindering the permanent natural compression which you want. There are other objections—the unavoidable bruising of the uterus, and the keeping open a channel through which germs of disease may get inside the wound.

The right way is to compress the uterus between one hand in the vagina and the other on the abdomen. In the left lateral position the left hand will naturally be used internally, the right outside. The internal hand may be laid flat (as suggested by Hamilton, of Falkirk*), the body of the uterus being opposed to the palm, the cervix lying between the parted fingers.

Zweifel† has advised that the cervix be pressed forwards with the fingers so as forcibly to anteflex the uterus. Thus the canal is kept so bent that blood cannot get out. But there is no benefit in keeping blood in the uterine cavity. We want to compress the vessels in the uterine *wall*, so that blood may not flow into the cavity. If such bleeding has taken place, the effused blood will, in proportion to its amount, hinder uterine contraction, if it be thus retained. Blood effused into the uterine cavity should be expelled from it, not kept pent up with it.

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* *Ed. Med. Journal*, 1861.

† *Geburtshülfe.*

The best way of firmly compressing the uterine body is to bend the fingers of your left hand into the palm, and grasp the uterine body between your right hand on the abdominal wall and the firm resisting surface formed by the closed fingers and ball of the thumb of your left hand (Fig. 122). By this use of the hands the whole of the uterine body can be firmly compressed, and clots can be squeezed out through the cervical canal, which is not blocked up, as it is in Zweifel's method. This method brings with it no risk of injury to the uterus, offers no increased facilities for the entry of germs, and secures the maintenance of one essential condition for permanent uterine re-

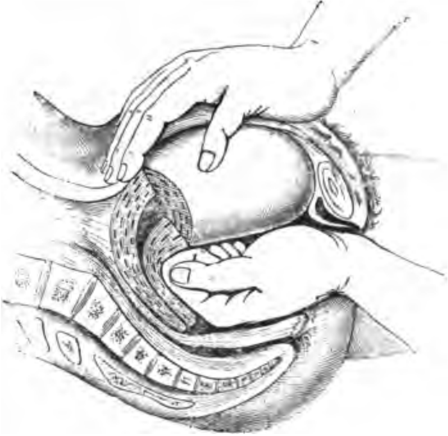

Fig. 122.—How to compress the Uterus to stop post-partum Hæmorrhage.

traction and contraction—namely, an empty uterus. The pressure need not be more forcible than is needed to press the uterine walls together. It is a little irksome to keep it up, but it can be maintained quite long enough for the blood in the vessels to clot. It is not more irksome than the repeated manipulations and the anxious watching of their effect which other less certain modes of treatment involve.

In short, when the uterus will not contract, the only thing that can be relied on is the maintenance of firm compression. By "compression" I mean not simply kneading the uterus to make it contract, but firmly and continuously compressing the uterus, just as a surgeon would compress a vein wounded during an operation. Do not postpone this until after repeated failure of attempts to get contraction; but as soon as ever it is clear that stimulation fails to produce lasting contraction, steadily compress the uterus and maintain pressure until it can be relaxed without bleeding occurring.

Pressure on the aorta has been used to stop post-partum hæmorrhage. But pressure directly on the bleeding part is better.

B. HÆMORRHAGE FROM INJURY TO THE UTERUS.

The injuries to the uterus that cause post-partum hæmorrhage are of two kinds:—

(*a*) Laceration of the cervix.
(*b*) Inversion of the uterus.

(*a*) **Laceration of the cervix,** so extensive as to cause dangerous hæmorrhage after the birth of the child, is very rare, although the cervix is torn in almost every first labour, and in many labours which are not the first. Lacerations of the body of the uterus bleed, and such ruptures may extend down into the cervix, but in these cases the child is generally not delivered, so that most of the bleeding is not post-partum. The ordinary tears of the cervix extend from below upwards, and result from excessive action of the dilating force, so that the cervix tears instead of dilating. The larger the os, the more powerful is the dilating action of the part pressed into it, and the thinner the rim of the os, the more easily is it torn. Most of these tears stop at the insertion of the vagina, because the presenting part does not usually press strongly enough into the cervix to tear it until the vaginal insertion is fully or nearly fully dilated.

Tears only affecting the vaginal portion do not cause bleeding which is serious in amount. But sometimes the tear extends beyond the vaginal portion, up to or even through the internal os. A tear extending as high as this may involve a considerable branch of the uterine artery. Tears so large as this hardly ever occur in labour completed by the natural forces. They happen when the accoucheur, to get a fœtus through an imperfectly dilated cervix, adds vigorous pulling to a strong pain. Such a tear is also likely to happen when dilatation of the cervix is hindered by scar tissue. The resistance of the scar provokes stronger uterine action than usual, and then, when at length the scar does give way, the unusual strength of the uterine contraction that tore the scar across may rend the cervix to a higher level than any ordinary pain would do.

The **diagnosis** of this unusual kind of hæmorrhage is not difficult. It rests upon this fact: that bleeding from the placental site is always stopped by retraction of the uterus. If, therefore, you have got firm persistent retraction and contraction of the uterus, and still there is bleeding, it probably comes from a torn cervix. The bleeding from a torn cervix is insignificant compared with that from a relaxed uterus, and uterine contraction will often stop the bleeding from a laceration. Therefore, in any case of post-partum hæmorrhage, the first aim of treatment is to get uterine contraction. This done, and bleeding still going on, think of laceration of the cervix; make your hand aseptic, pass it into the vagina, and feel the state of the cervix. The cervix after delivery feels very soft and uneven, so that without carefully tracing it all round, a tear will not be easily detected.

Treatment.—These cases are exceedingly rare. The treatment must be applied to the bleeding spot. There are three ways of doing this. You may have to use the first as a makeshift. It is *to plug* the vagina, stuffing the plugging material more especially into the tear. Iodoform gauze is the best material to plug with, but if you have not this with you, use anything clean that you can get, taking care to make it aseptic. This is not the best treatment, but you can always get something to plug with, and you may not have with you what is needful for more effective treatment. The second is to apply a *styptic.* Swab the part with a solution of perchloride of iron, 1 in 6, or stuff wool or lint, soaked in this solution, into the rent. This is clumsy treatment. We never trust to styptics in bleeding from wounds that we can see.

The proper treatment is to *stitch* up the tear. Get someone to press, by the abdomen, the uterus down as far as possible, to bring it within easy reach. Pass in two or four fingers of your left hand up to the top of the tear. With your right hand pass up a threaded needle in a holder, guarding its point with your left hand, and pass a stitch through the two sides of the tear. You cannot expect with a stitch put in like this so to close the rent as to make it heal, but the pressure of a stitch will stop bleeding. It has been recommended to expose the part with a speculum, and thus sew it up. These cases are so rare that I cannot from experience say which method is the better, supposing that speculum, assistants, light, etc., are all ready. But you ought to have needles, thread, and holders with you, in readiness for possible rupture of the perineum, and you will only seldom have the tools for stitching with the aid of sight. It has been proposed to stitch up tears that are not big enough to bleed, under the idea that disease of the uterus might thus be prevented; but there is no evidence that any disease is so prevented (*b*) **Inversion of the uterus** means that the organ is turned inside out, so that what is normally its internal surface becomes external and bulges into the vagina like a tumour; while its peritoneal surface becomes a cavity, in which lie the ovaries and tubes. Sometimes the cause that produced inversion produces also prolapse, so that the inverted womb protudes outside the vulva.

How produced.—Inversion may take place before, or during, or after the detachment of the placenta, and accordingly the placenta may be adherent to the inverted uterus or be partly separated, or the uterus may be free from the placenta. Inversion of the uterus is produced in one of two ways: the body of the uterus may be (1) pushed down from above, or (2) pulled down from below. For the production of inversion it is necessary that the body of the uterus should be quite relaxed: it is not possible that the uterus should be inverted while it is contracted. The internal os may or may not be contracted.

(1) The body of the uterus may be pushed down either by the patient's own bearing-down efforts or by the pressure of the attendant's hand on the abdomen. The uterus cannot remain long relaxed after delivery, for were it to do so, the patient would soon die from hæmorrhage. Inversion, therefore, of the uterus can only occur immediately after the birth of the child or the expulsion of the placenta,

(2) The body of the uterus may be pulled down by the cord. The cord may be too short to allow birth of the child without change in the situation of its uterine attachment, or it may be made short by being coiled round the child; it may be accidently pulled upon, as when the mother is delivered while standing; or it may be injudiciously pulled upon to remove the placenta. The uterine body may also be dragged down by a fibroid tumour attached to it: this latter is the only way in which inversion is produced apart from pregnancy.

The late Dr. Matthews Duncan divided inversion of the uterus into active and passive, according to whether the lower part of the uterus was contracted or not. The force which began the inversion may complete it, without help from the lower segment or cervix—this is *passive* inversion; or the relaxed upper part of the uterus may be pushed or pulled down through the lower part of the uterus, and then this lower part may contract round it and force it farther on — this is *active* inversion. If inversion of the uterus produced by one of the above causes has only taken place to a slight extent, forming a dimpling-in of the fundus, and then the uterus contracts, the contraction will restore the uterus to its proper shape and undo the partial inversion (Fig. 123). We do not know where to draw the line between the slight degree of inversion that is replaced when the uterus contracts and the degree which is forced farther on by uterine contraction. If inversion has been begun by some other cause, and the patient strains or vomits, such efforts will increase the inversion and favour its combination with prolapse.

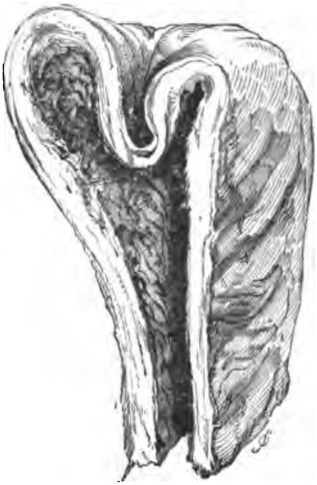

Fig. 123. — Commencing Inversion of Uterus. *(From a Specimen in the Museum of Guy's Hospital.)*

Symptoms.—These are those of hæmorrhage *plus* collapse. The collapse comes on suddenly with the inversion, so that it is not wholly produced by loss of blood. The patient is pale, with an anxious expression of face, a very small and quick pulse, sighing breathing, and restlessness. With these symptoms there is hæmorrhage from the vagina. German writers attribute the collapse to the reduction of pressure within the abdomen. If this were enough, we ought to have collapse whenever a case of ascites is tapped or a large ovarian tumour removed. I think it due to the strangulation of the uterus and the sudden exposure to friction of so large a sensitive surface as the interior of the uterus.

Diagnosis.—The diagnosis of acute inversion of the uterus ought to be easy. A mistake can only be made by a person very ignorant or so frightened as to lose self-possession. If the tumour is seen outside, with the placenta attached to it, its nature is evident at a glance. If it is inside the vagina, and the placenta is felt attached to it, inversion is the only possibility. In the cases in which harm has been done from a wrong diagnosis, the inverted uterus has been taken either for the head of a second child or for a tumour. The first mistake ought not to be made, for nothing like sutures or fontanelles exists in an inverted uterus. The second error is the only one that is pardonable, and this ought to be avoided by feeling for the uterus through the abdominal wall. If the vaginal swelling be a tumour, the uterous will be felt above it when the belly is kneaded. If, on the other hand, it be inversion, when the hand is pressed down on the belly where the uterus ought to be, no uterus will be felt; but the top of the tumour will feel like a ring into which the tips of the fingers may be pressed. The uterus may be inverted by a tumour. Puerperal inversion is rare, and puerperal inversion by a tumour still rarer.

Prognosis.—About two-thirds of cases of uterine inversion die within the first few hours. Some die almost immediately from hæmorrhage and shock; others, when bleeding is not great, gradually sink in a few hours from shock. If this danger is conquered, the uterus may become inflamed or gangrenous. The patient may die from hæmorrhage at any time during the lying-in. If the patient escape these risks, involution of the uterus goes on, and acute inversion passes into chronic. The consideration of chronic inversion of the uterus is beyond the scope of this work.

Treatment.—The prophylactic treatment of inversion of the uterus consists in not dragging out the child or placenta in the absence of pains; in watchfulness to see that the cord is not, by reason of either shortness or coiling round the child, made tense and dragged down during the birth of the child; and in taking care that good uterine retraction and contraction are maintained after the birth of the child.

When inversion has occurred, the treatment is to push back the inversion. However exhausted the patient may be, and however unfit she may seem to undergo an attempt at replacement, you must remember that this is the *only* thing that will benefit her, and that the longer you wait the more difficult reposition will be, and the less fit will the patient be to endure it. Therefore, do not waste time in trying to revive the patient's strength, but replace the uterus *at once.* If the placenta is still attached to the uterus it matters little whether you detach it or not. If you can peel it off quickly, do so; if not, reduce the inversion with the placenta attached. If the uterus is still relaxed, reposition is easy. Press the closed fist against the fundus and push it up; or take the uterus in the palm of the hand, compress it so as to make it as small as possible, and press it up in the axis of the pelvic inlet. Steady pressure in the right direction is required, rather than great force. It is often recommended to make counter-pressure with the hand on the abdomen, lest the uterus, when forced up, should be torn from its attachments. This precaution is good, but the upward pressure ought not to be so violent as to make it needful. An anæsthetic will make reposition easier, but rather than delay replace the uterus without anæsthesia. If the uterus be contracted, reposition will be impossible; hence the need for haste.

C. DISEASE OF BLOOD OR BLOOD-VESSELS.

There are certain diseases which render the patient more liable to bleed. These are chronic Bright's disease, scurvy, purpura, phosphorus poisoning, acute atrophy of liver, hæmophilia. The acute renal disease which produces eclampsia is not usually attended with vascular degeneration, and therefore has no marked tendency to cause hæmorrhage. These diseases are rare in pregnant women, for women suffering from them seldom become pregnant, and if they do, often abort early. The treatment of post-partum hæmorrhage from these causes is the same as that of hæmorrhage from uterine atony.

TREATMENT OF COLLAPSE AFTER HÆMORRHAGE.

In post-partum hæmorrhage the first thing is to stop the bleeding. All other treatment, such as raising the foot of the bed, bandaging the legs, injecting ether or brandy, etc., is mere trifling in comparison with stopping the bleeding.

Suppose, now, that you have got this done. The uterus remains retracted, with contractions recurring at intervals. Be certain that this state is permanent before you discontinue attention to the uterus. Do not leave the patient, but examine the womb through the belly-wall every five minutes for at least an hour after the bleeding seems to have stopped.

If the bleeding has stopped, the patient is not therefore out of danger. If very much blood has been lost, so that the patient is greatly weakened, she may slowly get weaker and weaker, and die from exhaustion some hours after the cessation of the bleeding. The pulse gets smaller and smaller, the extremities become cold, the breathing begins to be hurried, and the patient becomes restless. This may happen in spite of the utmost attention in plying the patient with liquid food and stimulants.

When a patient dies from bleeding, death takes place from reduction of the amount of *blood*, not from loss of *blood corpuscles.* A previously healthy patient dying from hæmorrhage has more blood corpuscles than one who is walking about in a state of great anæmia. Therefore, to prevent death from bleeding which has already taken place, what we have to do is to put more fluid in the blood-vessels.

The **transfusion of blood** is a very old remedy. It is dangerous and ineffective. It is *dangerous*, because blood drawn from the veins clots, and the introduction of clot into the circulation may kill. Different plans have been devised for avoiding the dangers of transfusing blood, but none of them is satisfactory. Instruments have been invented for transfusing blood directly from the vein of the giver to that of the receiver, so that the blood may get into the receiver's circulation before it has time to clot. But there is no instrument that meets the requirements of practice; they are all either difficult to work or uncertain in their action. No mode of transfusion is useful that is not easy, for the operation has to be done in a hurry, and it is so seldom called for that few have the opportunity of gaining dexterity by practice. Blood has been defibrinated by whipping. This takes a long time, and you want the remedy quickly. If the defibrination is not perfect, the operation is dangerous. The blood has been prevented from clotting by mixing it with phosphate of soda. But the clotting of blood is a vital action, and one would expect that an agent which will prevent the blood from clotting out of the body would interfere with the life of the blood in the body into which the phosphate of soda is injected. As a matter of fact, all the reported cases in which this solution has been used have ended fatally.

The transfusion of blood is *ineffective*, because you cannot prudently take from the giver as much blood as is necessary to revive a patient sinking from the effects of a great hæmorrhage.

Intravenous saline injection.—The safest way to sustain the circulation of such a patient is to inject saline fluid into the veins. Water may be injected without doing injury, but it seems more physiological to inject a fluid of nearly the specific gravity of blood serum. Common salt may be had in any house. If you can get six pints of water that has been boiled, you may be sure that it will not contain any microbes. If you cannot get so much boiled water as this, reflect that the chances against ordinary tap-water containing disease germs are as

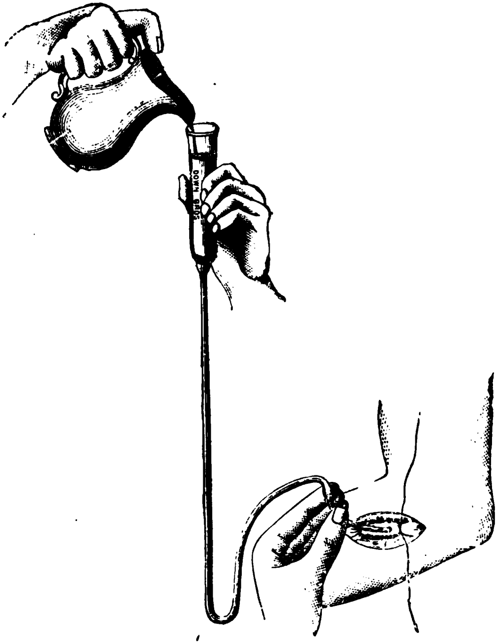

Fig. 124.—Intravenous Saline Injection. (*After Horrocks.*)

millions to one, and use water from the tap. Get it as nearly the temperature of the body as possible; but if a few degrees below that temperature, no harm will result. Dissolve common salt in the water, a teaspoonful in each pint.

Cut through the skin over the median cephalic vein, and expose the vein. Put a couple of probes underneath it, and move one upwards, the other downwards, so as to isolate a little strip of vein between them. Fill the funnel or syringe with the fluid. Let a little run out, so that you may be sure the nozzle does not contain air. Open the vein and insert the nozzle. Let a little fluid run, as a further precaution against the admission of air, and then remove the upper probe, and the fluid will flow on into the circulation (Fig. 124). A funnel may be used. The syringe recommended by Braxton Hicks can be used either as a funnel or a syringe. The intravenous injection case should contain a funnel or syringe, piece of indiarubber tubing about 18 inches long, two nozzles for intravenous use, dissecting forceps, two double-edged fine knives in handles, four probes, Gamgee tissue, and a foot of strapping at least an inch wide.

CHAPTER XXV.

THE FORCEPS.

The forceps may be described as an artificial hand, the use of which is to grasp the fœtal head and pull it through the pelvis when the natural forces are unable to push it through.

Consider first *when* to use the forceps, and then *how* to use it.

Indications for forceps.—The great indication for forceps is that the pains are not strong enough to effect delivery within the ordinary limit of time. The reason of this may be either (1) "*primary uterine inertia*," everything else being normal; or (2) that, although the pains are as strong as usual, there is *obstruction*, with *relative weakness of pains.* The obstruction may be either due to the bones or the soft parts. Obstruction due to the bones may be either because the *pelvis* is too small or the *child's head* too large. In either form of lingering labour it may be the best practice to help delivery by pulling.

The forceps is intended to seize the head. It is, therefore, *only to be used in head presentations.*

Membranes should be ruptured.—The forceps is *never required while the bag of waters is entire,* for the reasons which follow:—1. In some few cases the liquor amnii is abnormally deficient. It is impossible to distinguish such cases from those in which the liquor amnii has escaped early, and therefore for practical purposes such cases may be regarded as cases in which the membranes have ruptured. 2. The forceps is not required while the bag of waters is entire and the os is not fully dilated, because the bag of waters will dilate the cervix far better than the forceps, and no danger can come to mother or child from delay so long as the bag of waters is entire.

3. If the os is fully dilated and the membranes not ruptured, the proper course is to rupture them. If labour should before have seemed lingering, the rupture of the membranes will often provoke more vigorous action of the uterus.

When possibly required.—When the head is presenting and the membranes have ruptured, there are three conditions in which we may have to consider whether forceps ought to be used.

1. The os uteri is not fully dilated and the head is above the brim.
2. The os uteri is fully dilated and the head is above the brim.
3. The head has descended into the pelvic cavity.

Cases of the first and second kinds are rare. Cases of the third kind are very common, and form the vast majority of those in which the instrument is used.

Consider these three conditions more fully.

1. **Before full dilatation of cervix.**—The forceps is sometimes, but very seldom, needed before the os uteri is fully dilated, but never unless the head is so detained above the brim of the pelvis that it cannot come down into the os to dilate it. With a well-shaped pelvis and a child of average size the head sinks well down into the lower segment of the uterus before labour begins, and remains there while the os is dilating. With a normal pelvis and fœtal head there can be no reason for applying forceps before dilatation of the os to four-fifths of its full size.

If the pelvis is flattened, the head during the first stage may remain above the brim, pressed down upon it during the pains, but movable above it while the uterus is relaxed. Pressure upon the uterine wall will never be continuous while the os uteri is small, for tonic contraction of the uterus never comes on in the early part of the first stage of labour. There is therefore no reason for applying forceps with the head above the brim at this time. Special forceps have been constructed for application through a small os uteri. Experience has shown that this is very bad practice.* If the head can come down into the os, it will dilate it; and if the dilatation is slow, the remedy is to support the patient's strength while the os is being opened up by giving her food and promoting sleep, not to tear the os open by dragging the head rapidly through it.

It may therefore be laid down as a rule that the forceps is never required while the os uteri is so small as not to admit four fingers; and if the head can come into the os and stretch it, the forceps is not required until the os has been fully dilated.

Head above the brim; os dilatable.—The only cases in which the forceps can be required before full dilatation of the os are cases of contracted pelvis in which the head is presenting in a favourable position, the membranes have ruptured early and the uterus is acting powerfully, forcing down the head upon the cervix, and compressing it against the brim of the pelvis so as to hold it down. If this happens, the consequences of pressure that have been described in chapter XIII. may follow if aid be not given. Such consequences only happen when the uterus has been acting for a long time, never while the os uteri is small. And delivery by forceps is the proper treatment in only a few of such cases. If the reason why the os does not dilate is simply that the head cannot come into it to stretch it open, then when the head is pulled through the brim with forceps the os will quickly stretch open. In such cases you find, after the membranes have ruptured, the cervix hanging down below the head like a thick fringe, but soft, and admitting three or four fingers easily. The question for decision here is whether there is only (*a*) contraction of such a minor degree that the head will come through by pulling, or (*b*) great disproportion, so that it cannot. If the latter, it is bad practice to waste time and run risk of serious injury by trying to deliver with forceps. In well-marked cases the decision is not difficult; but as we cannot ascertain with mathematical certainty the factors upon the combination of which the answer depends, there will in the present state of our knowledge always be some cases in which an exact diagnosis is impossible. Remember that with a flat pelvis the position of the head most favourable for forceps delivery is when the sagittal suture is running transversely, and distant about an inch from the sacral promontory. (See page 203.) We can measure within a quarter of an inch the conjugate diameter of the brim. We can form a rough idea, by examining the abdomen, whether the child is large or small, or of medium size. But we have no way of determining the degree of ossification of the bones of the skull, upon which depends the extent to which the head can be compressed during its passage through the brim.

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* It was carried out on a large scale at the Rotunda Hospital, Dublin, under the mastership of Dr. George Johnston, with the result of doubling the maternal mortality. (See Roper, Obst. Trans., vol. xxi.)

Size of flat pelvis usually admitting forceps delivery.—The average size of the bi-parietal diameter of the head is about three inches and three-quarters. That of a transverse diameter of the fœtal head taken about half an inch in front of the parietal eminences (which is the diameter that lies in the conjugate when the long diameter of the head is in the transverse diameter of the brim) is about three inches and a half. The sub-parietal super-parietal diameter, which in the most favourable situation (see page 203) is substituted for the bi-parietal, is about three inches and a half. By compression these diameters can be further diminished. On the average, a diminution of about a quarter of an inch is about the utmost which is both practicable and consistent with safety. Hence a conjugate of about three inches and a quarter is the smallest that will as a rule allow forceps delivery of a child at term. If the head be very hard, from the ossification being more advanced than usual, it may not be possible to compress it as much as this; if soft, from imperfect ossification, it may be compressed more than this. But great compression brings with it risk of death of the child from meningeal hæmorrhage.

2. **The head is above the brim, but the os uteri is fully dilated.**—In such a case as this the disproportion is probably slight, for the full dilatation of the os generally implies that the head has been able to come down far enough into it to stretch it open. Try to ascertain how high the greatest diameter of the head is above the brim, and if it be only a little above the brim its delay in entry is probably only from weakness of pains, and it will be possible to pull the head through with forceps.

3. **Head in pelvic cavity; primary inertia.**—The most common indication for forceps is *primary uterine inertia in the second stage* of labour. In the first stage of labour primary uterine inertia requires no treatment save patience. When the os uteri has reached four-fifths of its full size, rupture the membranes if they have not already burst. This will very often provoke stronger and more frequent pains, (1) because the hard head irritates the cervix more than the soft bag of membranes, and so produces reflex contraction, and (2) because the letting off some of the liquor amnii diminishes the uterine contents and so helps the uterus to retract. When this is done the dilatation of the os should be finished within an hour or two, and the second stage should last in primiparæ about two hours and in multiparæ about half an hour. But if pains do not gain in strength and frequency, instead of the labour being over in three or four hours it may drag on six or eight hours or even longer. This long-continued suffering will at least make the mother very tired, it may make her exhausted, and it is possible that it may favour the occurrence of post-partum hæmorrhage, although there is no proof of this. If the case be let alone, very likely secondary uterine inertia will come on, the pains will get less and less frequent and cease; then the patient will sleep for an hour or two, and after she has slept the pains will

recommence. But there is no advantage in letting the mother's suffering be prolonged in this way, and if regular pains are present no harm follows skilful delivery with forceps. In such cases, therefore, it is desirable, although not absolutely necessary, to deliver with forceps.

The following are the characteristic features of such cases. The head is low down in the pelvic cavity; it is not impacted; it moves on with each pain, presses down on the perineum, and opens out the vulval orifice; and goes back between the pains. The pains are not frequent, and they are weak; advance and recession are marked, but with each pain the head is pushed on only a very little farther than with the preceding one. The mother's pulse is not accelerated; she does not look anxious, and between the pains she is comfortable.

Impaction of head.—The next most common indication for forceps is delay in the second stage from *large size of the fœtal head.* When the pelvis and the head are well shaped the dilatation of the cervix goes on naturally, because the head comes down into the os, and so relieves the forewaters from the general intra-uterine pressure. When the cervix is fully dilated the head comes down into the pelvic cavity; but being very large and hard, it fills the cavity, compresses the soft parts which lie between it and the pelvic wall, and so the friction is great. Consequently it may become *impacted*, that is, stuck fast, neither advancing with the pains nor receding in the interval. When it has become impacted the continuous pressure on the soft parts impedes the circulation through them. Hence the parts below become swollen from œdema, and the mucous membrane does not secrete properly, and therefore it becomes dry. The congestion also makes it feel hot, and makes it more tender than it should be. If the impaction is allowed to continue long the parts pressed on will slough.

Therefore when impaction has taken place *immediate* delivery is necessary; and the only question is, whether the forceps shall be tried, or the head perforated. If the fœtal heart is audible, the swelling of the soft parts not great, the most advanced part of the head low down, the mother's pulse not very rapid, and her expression not anxious, if the pains are regular, and there are intervals between them, try forceps delivery. If, on the other hand, the uterus is in tonic contraction, the mother's pulse accelerated, her expression anxious, the vagina and vulva are swollen, dry, and tender, and after auscultation of the abdomen when the room is quiet you cannot hear the fœtal heart, do not waste time or incur risk of injury by trying forceps, but take up the perforator at once. A fruitless attempt to deliver with forceps implies an error in diagnosis on your part, although, as diagnosis of the amount of obstruction is not easy, the error is not very discreditable. But you ought not to let labour, rendered tedious by large size of the child's head, go on till the head is impacted; you should make an early diagnosis. If the child be large you will find that the abdomen is large; and by feeling the abdomen you will find that the enlargement is due to the uterus and not to dropsy or fat or a tumour; and that the uterine enlargement is due to a large child within it, and not to twins or a great quantity of liquor amnii. If the pelvis be not deformed the presenting part of the head will have sunk deep into it. You may find that its greatest diameter is a little above the brim, but you will not find it high above the brim. You will also notice that in spite of strong and frequent pains the head advances very little, and it recedes also comparatively little between the pains. These points—large size of the child as ascertained by abdominal palpation, strong and frequent pains, and yet slow advance—indicate that help is needed; and the fact that the head is either fully in the pelvic cavity, or almost fully, shows that the mechanical difficulty is not of such high degree that forceps delivery is hopeless.

These two conditions, primary inertia and large size of the head, are the indications for forceps when the head is in the pelvic cavity, and the pelvis is not known to be deformed.

In labour with the small round pelvis forceps is usually indicated unless the child is small. The signs marking the need for forceps are the same as those detailed in the last paragraph, except that there is no indication that the child is large.

Placenta prævia.—In certain cases of *placenta prævia*—viz. if the placenta is only partially or marginally prævia; the os dilated to four-fifths of its full size; the pains present, but feeble; the membranes ruptured; the head presenting with either face or vertex and coming down into the os during each pain—forceps should be applied.

You cannot apply forceps with the placenta completely covering the os. If the os is not dilated to as much as four-fifths of its full size, in extraction with forceps it will be stretched open, not by the globe of the head in the grasp of the forceps, but by the blades of the forceps below the head, and the forceps will be likely to tear or cut the cervix, an accident especially to be avoided in placenta prævia. The half breech will be a better dilator than this. If the pains are strong there is no need of forceps. If they are absent, by hastily-dragging out the child you expose the patient to much risk of post-partum hæmorrhage. If the membranes are not ruptured by the time the os is four-fifths of its full size, you ought to rupture them; possibly when this is done the pains may become strong enough to deliver the child quickly. If the head cannot come down into the os, and is detained above the brim, turning will be better than a prolonged attempt at forceps delivery; for by turning we more quickly diminish the uterine contents and thus help the uterus to contract.

Prolapse of funis.—Forceps delivery is called for in some cases of *prolapse of the funis*, viz. those in which in a multipara, the os is fully dilated, the head well engaged in the brim, while down by its side there is a loop of cord which cannot be got to stay in the uterus. In such a case, rapid delivery, so that the cord may be pressed on for only a short time, gives the best chance for the child, and is not likely to harm the mother If the head is not engaged in the brim, the os not fully dilated, the soft parts of the pelvic floor as firm as they usually are in primiparæ, you will not be able to deliver quickly enough to save the child without the risk of serious lacerations of the maternal parts; here, therefore, turning is better.

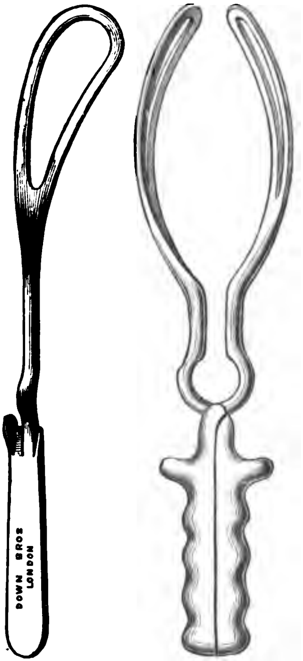

Fig. 125.—Showing the ordinary Forceps of the Pattern recommended by the Author.

The instrument (Fig. 125) consists of two halves introduced separately and afterwards locked. Each half consists of four parts: the blade to grasp the head, the shank, the lock, and the handle. The *blade* is of steel, but should be nickel-plated to prevent it from rusting. The blades will yield a little when they are pressed apart. Each is curved on the flat, to hold the head. This curve should be part of a circle having a radius of four inches and a half, and is called the head curve. The blade is also curved in the plane of its edge, to adapt to it the axis of the pelvis. This is called the pelvic curve; the amount of curvature is the same as that of the head curve. The surface is smooth, and the edges are rounded. Each blade is open in the middle, so that it may take up less room. The distance between the blades at their widest part outside is usually 3⅜ in.; between the tips 1¼ in. When applied to the head the distance is greater, because the blades yield. The tips should not come nearer together than this, for if they do it is possible the child may be injured when they are pressed together. The *shank* is the part between the blade and the lock. Its purpose is to lengthen the instrument, so that when it grasps the head at the brim the lock may be outside the vulva. The part nearest the lock is bulged out so as to leave room for a finger for convenience of pulling.

The English *lock* (which is the best) consists of a shoulder with a groove, where the handle joins the shank; in the groove the shank of the opposite blade lies. Continental forceps are joined by a stud on one blade which enters a slot in the other. The English instrument-makers so place the grooves that the shank of the right blade lies in front of that of the left one. Hence the left half of the instrument, which in the ordinary position is the lower, must be put on first. If the upper blade is put on first, the lower must be passed between it and the perineum.

The *handles* are best made of metal, so that the instrument can be boiled if necessary. They should have a projecting shoulder on which the fingers can pull. Their sides are generally made undulating that a better grasp may be got. There should be no roughening by cutting of fine lines; for such fine lines hold dirt, and are hard to clean. The length of the whole instrument is about fifteen inches.

Short forceps without pelvic curve were at one time used. But they can only grasp the head when it is in the pelvic cavity, not when it is at the brim. The long forceps can be used just as well in the cavity as at the brim. Therefore there is no need to load the bag with both instruments.

Action of forceps.—You can do two things with the forceps: (1) pull; and (2) compress the head. Of these, pulling is the chief. You may pull in two ways: (1) a straight pull; (2) pulling so that you make the head with the forceps into a lever. This is done by swaying the handles from side to side, and is called the "pendulum movement."

Pendulum movement.—The effect of this movement is twofold: (*a*) to overcome the resistance due to friction, (*b*) to change the position of the head.

(*a*) *To overcome frictional resistance.* When with the forceps the head is swayed from side to side, the head is pressed more strongly against the wall of the pelvis on the side towards which the handles of the forceps are swung than on the opposite side. Hence on that side the friction is greater. The head is converted into a lever, the side pressed against the pelvic wall being the fulcrum, the weight the resistance to the advance of the head.

Galabin has shown that one of four results may follow from the pendulum movement.

1. The side of the head most pressed against the pelvic wall may be fixed. In that case the other side will move on.

The head with the forceps forms a lever. The fulcrum is at the pelvic wall against which the fixed side of the head presses. The resistance acts along the pelvic axis, not far from the centre of the head. (The exact place depends upon the size of the pelvis and the ease with which the soft parts can be dilated. If the resistance is mainly from the bones, it will act at the point where the head is in contact with the opposite pelvic wall. If from the soft parts, it will act near the centre of the head.) The power acts at the point where the handles are grasped. Only that part of it which rotates the head about the fulcrum exerts a leverage action. The mechanical advantage of the lever is measured by the ratio of (α) the distance between the place where the handles are grasped and the fulcrum to (β) the distance between the point at which the resistance acts and the fulcrum. With ordinary long forceps the former (α) will be about eleven inches, the latter (β) (taking the resistance to act on the centre of the head) about two inches.

2. The side of the head pressed against the pelvic wall may slip back somewhat, but not so much as the opposite side advances. In this case (supposing the resistance to be as before) the fulcrum is an axis intermediate between the centre of the head and the side which is pressed against the pelvic wall. When traction combined with the oscillatory movement is made, the friction over the part of the head which slips back is reversed in direction, since it is made to resist a slipping back instead of an advance. Hence the force needed to make the head move on is less than that which would be wanted with direct pulling by twice the amount of friction which is so reversed; for the reversed friction, instead of opposing the onward pull, assists it, by neutralising an equal amount of friction at the other side of the head.

3. One side of the head may slip back as much as the other side descends. In this case there is no leverage tending to aid extraction, no advance of the centre of the head, and the pendulum movement is useless.

Dr. Galabin, in the able paper from which the above is taken, says (speaking of the case in which one side of the head slips back a little, while the other side moves on more), that "under the most favourable conditions possible the amount of friction reversed might be nearly one half of the whole. In this case nearly the whole of the resistance due to friction might be done away with by the use of the oscillatory movement of the handles." In this statement *friction is only considered as opposing advance.* But friction not only opposes advance, it opposes rotation; and *considered as opposing rotation*, the friction at opposite ends of the head globe helps one another instead of opposing one another. In case 3 (one end slipping back as much as the other slips forwards) there is not only no gain from oscillation, but loss, for the power which would otherwise have made the head move on is expended in overcoming the resistance of friction to rotation. In case 2 the more the head slips back the greater is the frictional resistance to rotation. It is difficult to say at what point the gain by overcoming frictional resistance to advance, is greater than the loss by creating frictional resistance to rotation.

4. The remaining possibility is that the forceps may slip on the head. Therefore, if the pendulum movement is to be used, the forceps should be held tightly; for slipping of the forceps will not only make the movement useless but bring with it danger of injury to the soft parts.

(*b*) *Advantage of the pendulum movement in changing position of head.* It is not possible with the knowledge that we can get of the size and shape of a particular pelvis and that of a fœtal head, during labour, to be quite sure that the head is lying not only with its smallest but with its most compressible diameter across the smallest diameter of the pelvis. The diameter which is the smallest is not of necessity the most compressible. By the oscillatory movement we change the position of the head, and it is possible that such change may bring a smaller, or a more compressible diameter, across the pelvis, and in this way make delivery easier.

The illustration of the straight pull used in drawing a cork from a bottle with a corkscrew has been brought as an argument against the pendulum movement. It has been pointed out by Galabin that a fœtal head is not a cylinder like a cork. I may add further, that although with a corkscrew a straight pull is used, when one tries to get a cork out with the fingers the pendulum movement is used. The cork is pressed first one way, then the other, and this pressure compresses one side of the cork, loosens the other, and thus helps extraction. In a like way it is possible that the pendulum movement applied to the fœtal head may compress one side of the head and loosen the other. We have no means of knowing that this takes place, but it probably does. In this way, rotation, although increasing friction, may yet aid extraction.

In these two ways the pendulum movement is advantageous.

When pendulum movement advantageous.—When the head is arrested at the brim, as in a flat pelvis, the cause of detention is not friction but narrowness of the passage at one point. To get past it the head has to undergo temporary compression. The leverage effect of the pendulum movement is not advantageous; but its effect in getting a more compressible part of the head into the brim may be. If pains are weak, and the cause of delay is in the slow opening up of the soft parts, there is no advantage in oscillating the head. The cases in which the resistance is from friction are those of impaction of the head in a small round pelvis, or of a large head in the cavity of a normal pelvis. Here the rotation from side to side is as useful as rotation from before backwards; and it is attended with less liability to slipping of the blades on the head. For this reason I have described the effect of oscillation from side to side instead of that of oscillation from before backwards, which is supposed to take place in the paper of Galabin above quoted.

Compression.—It is possible to compress the head with the forceps. It has been recommended to tie the handles of the forceps together, and clips and screws have been attached to forceps to keep up compression. These are bad. The head should be delivered with as little pressure on it as possible, and that pressure should be for as short a time as possible. There is no need for you to squeeze the head. If with forceps you pull it down, the wall of the pelvis will compress it; and this squeezing is applied just where it is wanted, and nowhere else.

Compression should be intermittent, not continuous. Carried beyond a certain point it is dangerous, leading to cerebral or meningeal hæmorrhage. It is impossible to apply compression with such accuracy as to be sure that you are assisting delivery and yet not putting the child's life in danger. With ordinary forceps the degree of compression connot be measured, and if it could, we do not know what amount of pressure brings with it danger of hæmorrhage. You will therefore best avoid damage by squeezing the head for as short a time as possible, and as little as possible. The last condition implies that, if the squeezing is to be effective, it must be applied exactly in the right place. This is not always done with the forceps. When applied in a flat pelvis, the forceps compresses the head in a diameter in which there is most room. Even in a small round pelvis, or in labour protracted by great size of the head, you cannot be certain that the head is being squeezed precisely in the direction in which reduction of its size is wanted. It is sometimes further argued that when the head is compressed in one direction, its diameters in others are increased. This is so. But it does not follow that any diameter that has to enter a pelvic diameter is increased. The increase is often in the direction of elongation of the head, not in increase of the diameters which lie in the pelvic planes. .But in some few cases, pressure with the forceps on the diameter lying in the transverse diameter of the pelvis does lead to slight elongation of the diameter lying in the antero-posterior diameter of the pelvis; and this is a further argument against direct compression with the forceps. To get the head compressed in exactly the diameter in which compression is needed, the right course is to pull, and let the pelvis do the compression. To get the greatest effect from pulling, pull with the pains, and cease pulling (thereby discontinuing compression of the head) in the intervals of pain.

If these principles be sound, all contrivances for tying or locking the *handles* of the forceps together are bad.

Risk to child.—The great *danger to the child* from forceps delivery is meningeal hæmorrhage.* There may be hæmorrhage into the brain, but this is much rarer (as 1 to 12) than meningeal hæmorrhage. The hæmorrhage is caused by the driving in of edges and corners of bone, either by the tip or edges of the forceps, or by the projection of the promontory. The most vulnerable part is the anterior and lower angle of the parietal bone. Hæmorrhage is rather more common around the base of the brain than over the hemispheres. The pressure of the forceps blades may so compress the facial nerve or nerves, as to sever their continuity, so that facial paralysis occurs. This may be bilateral,† but is oftener on one side only. It usually gets well within a fortnight.

Application.—1. If the patient be not anæsthetised, warm the blades, lest the feel of the cold metal be disagreeable. If she be unconscious this is unnecessary. 2. Anoint them with sublimate glycerine.

The patient should lie with her body across the bed, so that the operator faces the orifice of the genital canal. Seated nearer the patient's back than this, you cannot easily pull in the proper direction.

Position.—In Great Britain the patient usually lies on her left side; in other countries on the back. The left-sided posture has the advantage that less assistance is required. In the dorsal position there must be an assistant to hold each thigh. As the forceps can be applied quite well with the patient on her left side, there is no advantage in making her change her position.

Choice of blade.—In the forceps sold by English makers the lock is so made that the right-hand (*i.e.* in the left lateral position, the upper) blade is in front of the other when the instrument is locked. Hence if you pass the upper blade first, you will have to pass the lower blade behind it, that is, between it and the perineum, which is inconvenient. Therefore pass the lower blade first. By lower blade is meant that lying in the lower or left side of the pelvis.

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* See Spencer, Obst. Trans., vol. xxxiii.

† See Edgworth, *Brit. Med. Journal*, January 6th, 1894.

Introduction.—Take the lower blade in your right hand. Pass up two fingers of the left hand until they either feel the os, or feel the head meeting the vaginal wall without the intervention of the cervix uteri. It is of the first importance that either the os should be felt, or that you should be quite certain that it is retracted above the greatest diameter of the child's head. Carelessness about this point has led to perforation of the vagina, the bladder, and even the abdominal cavity.

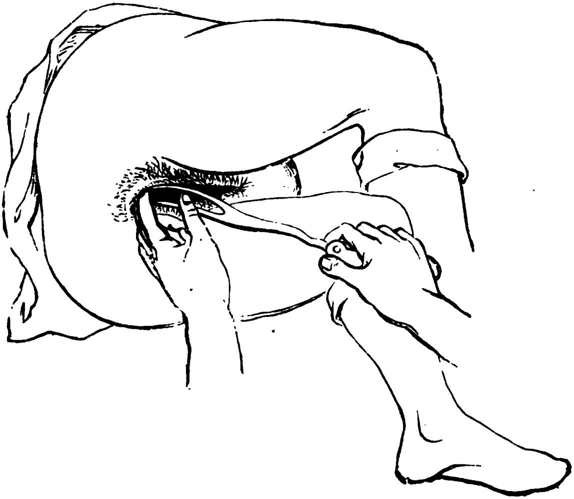

Fig. 126.—Showing first Stage of Introduction of lower Blade of Forceps: blade passed in antero-posterior direction, its tip impinging on left sacro-sciatic ligament. (*After R. Barnes.*)

Having ascertained beyond doubt the position of the os uteri, keep the tips of the fingers on the os, or, if the os be retracted, on the head as near as possible to the line of its contact with the pelvic wall, and pass the blade along the palmar surface of the fingers. Pass it so that the line of the handle and shank is parallel with the antero-posterior diameter of the pelvis (Fig. 126). When passed up in this way the tip of the blade will come upon the left sacro-sciatic ligament. Now, while you press the tip gently upwards, carry the handle in a curve first upwards and backwards, then still backwards and a little downwards. By movement of the handle in this curve the tip of the forceps is made to travel upwards and forwards, and is kept applied to the fœtal head (Fig. 127). When the movement is complete, the blade lies applied to the fœtal head, at the left end of the transverse diameter of the pelvis (Fig. 128).

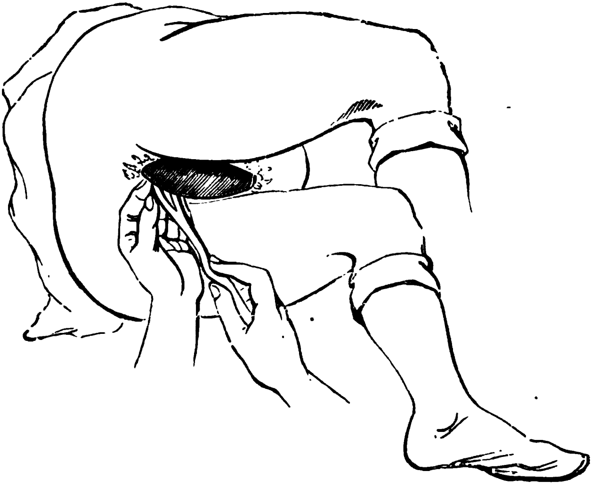

Fig. 127.—Showing second Stage of Introduction of lower Blade of Forceps: point moving upwards and forwards around head into left side of pelvis. (*After R. Barnes.*)

Now place the back of your left hand against the left blade of the forceps, and thus hold it in position. Keep the index and middle fingers applied to the os uteri or to the head, as you did in introducing the lower blade. Pass the upper blade, like the lower, at

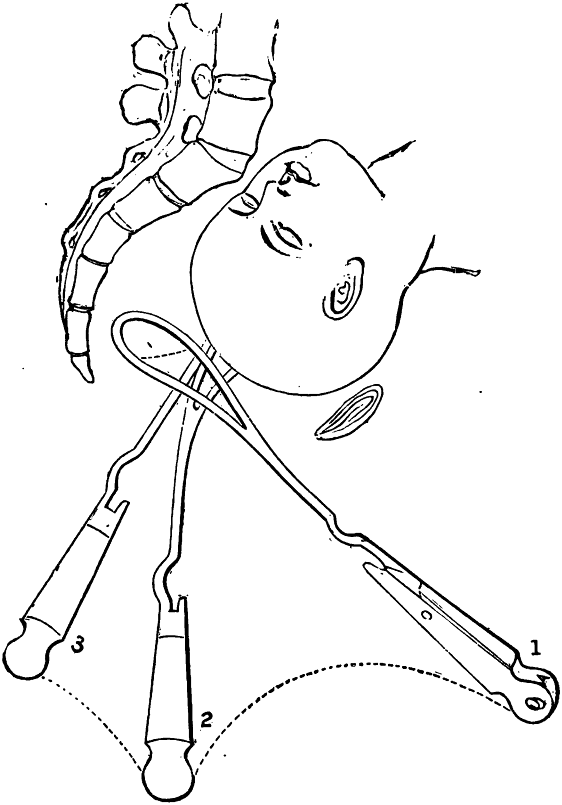

Fig. 128.—Showing successive Positions, 1, 2, 3, of lower Blade of Forceps during its Introduction. (*After R. Barnes.*)

first parallel with the antero-posterior axis of the pelvis, till its tip comes in contact with the right sacro-sciatic ligament (Fig. 129). Then make the handle move in a curve first downwards and backwards, pressing the tip gently on at the same time, then still backwards, but upwards, until its handle arrives close to the handle of the lower blade (Fig. 130). If they have been properly introduced, they will easily lock.

The advantage of introducing the blades in this way instead of passing them directly up the sides of the pelvis, is that to pass the upper blade directly into its side of the pelvis the handle must be so far depressed that unless the patient's pelvis be almost overhanging the side of the bed, the bed will prevent the handle from being lowered far enough. But if passed first in the antero-posterior direction it is immaterial, so long as the patient is within reach,

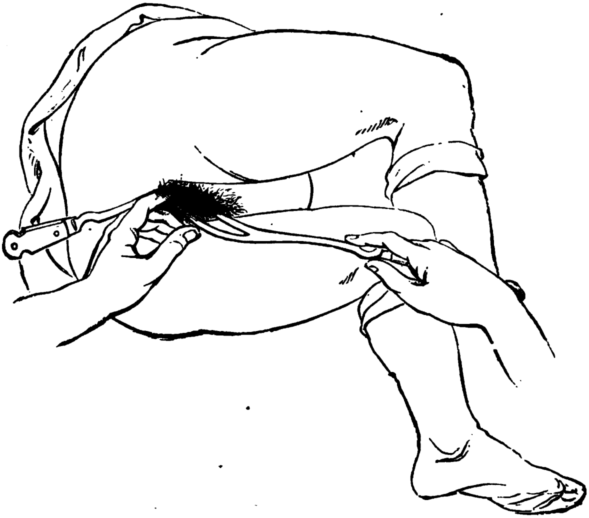

Fig. 129.—Showing last Stage of Introduction of lower Blade of Forceps, and first Stage of Introduction of upper Blade: handle of first blade well back; second blade entered in antero-posterior direction, tip impinging on right sacro-sciatic ligament. (*After R. Barnes.*)

whether the pelvis is near or far from the edge of the bed; and thus much trouble in putting and keeping the patient in position is avoided. This mode of introducing the forceps is called on the Continent the "manœuvre of Madame La Chapelle," for it was first described by her.

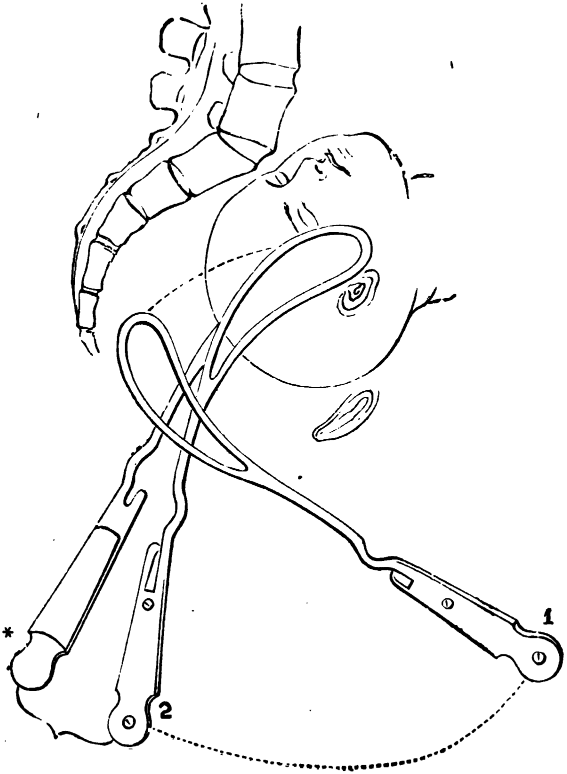

Fig. 180.—Showing successive Positions, 1, 2, of upper Blade of Forceps during its Introduction. (*After R. Barnes.*)

* Lower blade already in position.

If the blades do not lock, the probability is that it is from one or both of them not having been introduced far enough. If the lock of one of them is not as near the vulva as the other, press this blade farther up. If the flat surfaces of the handles do not face one another, carry the handles well back. This will move the blades into the sides of the pelvis, and when they are there the handles will lock.

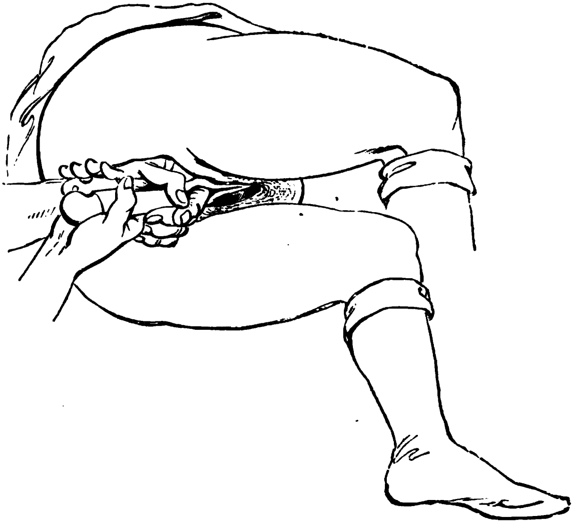
Fig. 131.—Showing Forceps locked and grasped by the Hands: line of traction as nearly as possible in axis of brim. (*After R. Barnes.*)

Extraction.—The great use of the forceps is to pull, not to squeeze. Put one finger in the bow of the shank, or the index and middle fingers on the shoulders; or with both hands use both ways. If the head is at the brim, pull as nearly in the axis of the brim, that is, a line drawn from the umbilicus to the coccyx, as the perineum will let you (Fig. 131). As the head comes down, pull more forwards, in the axis of the part of the cavity in which the head lies. *Pull with the pains;* leave off pulling between the pains.

Take care to deliver slowly, so as to give the perineum time to stretch. As the head stretches the perineum, change your grasp so that the radial border

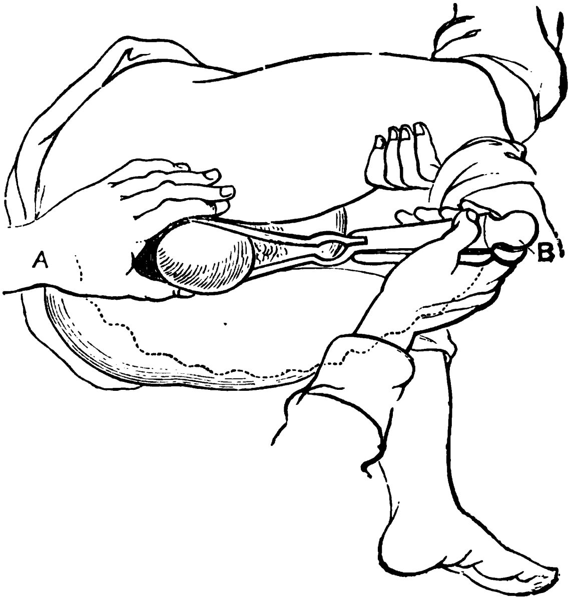

Fig. 132.—Showing last Stage of Extraction: the dotted line A B shows the "pendulum movement." (*After R. Barnes.*)

of your right hand may be towards the handle end, and carry the handles more and more forwards between the mother's thighs, so as to make the nape of the neck hug the symphysis closely (Fig. 132). When the perineum is so far stretched that its edge is over the anterior fontanelle, separate the blades of the forceps and take them off. When the head has got as far as this, the tension of the perineum will excite reflex action sufficient to expel the head. If either blade should not be lying quite flat on the head the edge may cut the tense edge of the perineum, and in any case the blades take up room and so cause a little extra stretching of the perineum. Some degree of inertia at this time is an advantage, leading to more gradual stretching of the perineum, and therefore less risk of rupture.

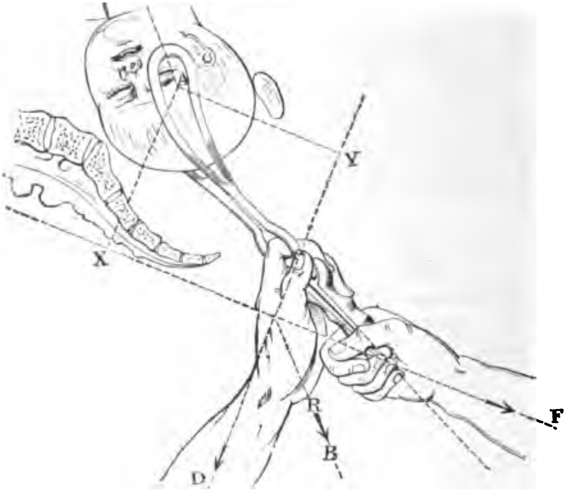

Fig. 183.—Showing how it is possible to pull in the Axis of the Pelvic Brim with the ordinary Forceps. The left hand pulls in the direction Y D; the right hand in the direction X F; if both hands pull with equal strength, and each in the direction of the corresponding fore-arm, the resultant of the combined pull will lie along the line A R B, which is the axis of the brim. The objection to this manœuvre is that the direction of the fore-arm is not that in which the operator can pull best. To pull with his full strength he must pull his arms towards his chest. (*After Galabin.*)

Axis traction forceps.—The ordinary forceps has three defects: 1. When it is applied to the head above the brim it is difficult, although possible, to pull in the axis of the brim, that is downwards and backwards. The perineum prevents the handles of the forceps from being carried sufficiently far back for a straight pull to act in the axis of the brim. It is possible, as the diagram by Galabin (Fig. 133) shows, to do so by what on the Continent is called "Pajot's manœuvre."* But when pulling hard it is difficult not to pull in the direction in which pulling is easiest. This defect has been overcome by giving the shanks and handles of the forceps a perineal curve. Many inventors have done this. The accompanying figure is an example (Fig. 134). Why such forceps are not used I do not know, except that they take up more room in the bag, for they are just as good as straight forceps.

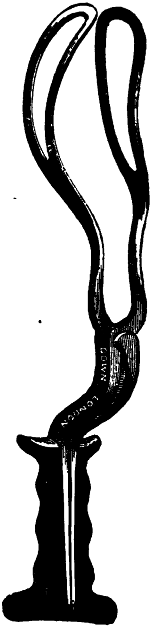

Fig. 134.—Galabin's Axis Traction Forceps.

2. It is important when delivering with forceps to keep the blades flat to the head. If you try to rotate the head with forceps, or if in pulling you do not hold the forceps loosely enough to follow the head in any turn it makes, an edge may be raised off the head and cut the vagina. And by not following the rotation of the head, you to some extent hinder the rotation.

3. If the pulling force is to act to the best advantage it must act in the line of the pelvic axis. This changes as the head advances. With the ordinary forceps the operator must judge where the head is, and therefore in what direction he ought to pull. He has no guide except feeling or seeing the head.

Advantages of axis traction forceps.—The axis traction forceps, designed by Prof. Tarnier of Paris, and modified in small details by others, is almost without these defects (Fig. 135). The essential difference between the axis traction forceps and the ordinary instrument is, that the handles used in applying the blades are not used for pulling. Pulling is done by a bar attached to traction rods: and the traction rods are jointed to the blades a little below the part that corresponds to the equator of the head. (Theoretically, they should be attached opposite the equator of the head: but this is opposite the middle of the fenestræ.)* The traction rods have a perineal curve. By this construction (1) the perineal curve makes it possible to pull in the axis of the brim. (2) The head is perfectly free to turn; for the traction rods are jointed to the blades so that the head can move about a transverse axis, and the traction bar is jointed to the traction rods so that the head with the forceps can move about a vertical

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* This manœuvre was independently described by Pajot and Galabin at about the same date. But Galabin gave the mathematical explanation of its effect.

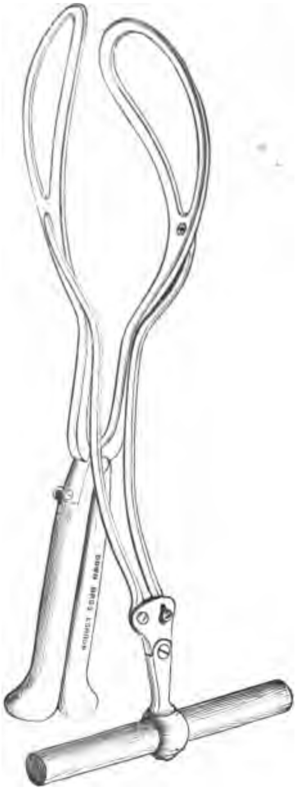

Fig. 135.—Axis Traction Forceps: pattern of Cullingworth.

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[*] As to the construction of axis traction forceps see papers by Milne Murray, *Edin. Med. Journal*, 1891.

axis. (3) The blades are fixed on the head by a screw. Hence they move as the head moves, and the direction of the handles therefore indicates the position of the head, and the proper direction in which to pull.

In these respects the axis traction forceps is superior to the ordinary instrument.

Defects of axis traction forceps.—The defects of this instrument are (1) its complexity: the number of joints and crevices in which dirt may lurk, and hence greater difficulty in keeping it clean. 2. The continued compression of the head while it is applied. If forceps were often required when the head is above the brim, the advantages would outweigh the defects. But in nineteen cases out of twenty in which the forceps is required the head is in the pelvic cavity; and the ordinary forceps will do just as well as the axis traction. In most cases in which assistance is needed while the head is above the brim, turning is better than any kind of forceps.

CHAPTER XXVI.

TURNING.

Turning means changing the position of the child, so as to make the head or the breech present instead of the part that at first presented. The latter clause is necessary to the definition, because it is not usual to describe under the head of turning the rotation of the head so as to get the occiput or chin forwards, the bringing down of the hands, the flexion of the after-coming head with the finger in the mouth, or other minor manipulations, although all these effect changes in the position of the child more favourable to delivery.

Indications for turning.—1. The chief indication for version is *transverse presentation.* Here the position of the child must be changed, or it cannot be born—unless there be some exceptional features, such as smallness of the child, or unusual strength of the pains. Of course it is not necessary to turn a six-months' child. But in the case of a child transversely presenting at or near term the chances are so much against its being born naturally, that turning is imperative.

2. In *placenta prævia.* The object of turning here is to get a part of the child's body into the os, so that it may press upon the vessels laid open by the separation of the placenta, and thus stop bleeding, and that at the same time the thigh and half-breech of the child may form a soft and safe dilator for the cervix.

3. In the *flat pelvis* when the head is presenting, and is not in the most favourable position for forceps delivery; and the degree of contraction is not such that craniotomy is required—that is, the conjugate diameter measures at least three inches. The bones of the head are more easily compressed when the head

comes through base first than when the vertex comes first, because in the former case the parietal bones are pressed together so that they meet one another at a more acute angle, and thus diminish the transverse diameter of the head. (See Fig. 88, page 205.)

In these cases the two following indications will often be present, viz.

4. In *face presentation*, when attempts at changing a face presentation into a vertex have failed, and the face does not engage in the brim, and therefore does not come down into the os uteri to dilate it; and there yet appears to be room enough in the pelvis for a living child to pass.

5. In *prolapse of the funis*, when the funis cannot be replaced, or will not stay up when replaced, and the evident cause of the prolapse is that the head does not come down into the brim.

6. In cases of *accidental hæmorrhage* in which the head is not presenting, it is well to turn and get the head or breech over the os, or the leg into the os, at the same time that you rupture the membranes.

7. Lastly, as turning is the best way in which, without instruments, you can hasten delivery; as in most of the rarer kinds of obstruction to delivery turning is the best practice; and as delivery by forceps is only indicated when you are sure that the head is in a favourable position for passing through the pelvis; it may be laid down as a practical precept in difficult labour—*when in doubt, turn.* But the cases in which you turn because you are in doubt ought to be rare.

Turning is an operation which *per se* is without danger to the child. Nevertheless many children delivered in this way are killed in the birth. It is *extraction*, not turning, that is dangerous. Therefore, do not turn if you can possibly avoid it, until the cervical canal is so dilated that you can, after turning, deliver quickly.

As the usual indication for turning is a transverse presentation, I shall describe the operation as it is done in a case of this kind.

Modes of turning.—There are three ways of turning the child.

1. By external manipulation alone.
2. By combined external and internal manipulation.
3. By internal manipulation alone.

1. **External version.**—This can, as a rule, only be done while the membranes are unruptured, and there is enough liquor amnii for the child to move about freely. Exceptionally, the uterus may be so relaxed even after rupture of the membranes as to allow external version to be done; but this is rare. You may do either *cephàlic* version, bringing the head into the brim, or *podalic,* bringing the pelvic end of the fœtus into it.

A. *Cephalic version.*—Put the patient on her back, with her knees drawn up. Let the abdomen be uncovered, and all bands around the waist loosened. Empty the bladder. Ascertain exactly the position of the head, which, in a transverse presentation, will be in one iliac fossa. Place one hand on the side of the head farthest from the pelvic inlet, and the other on the side of the breech farthest from the middle line. Then by steady pressure push with one hand the head towards the pelvic inlet, and with the other the breech upwards and towards the middle line. As your pressure is made on the uterus, and not directly on the child, its first effect is to move the uterus with the child in it, instead of the child in the uterus; and you will find that although you seem to get the child easily into the desired position, yet when you take away your hand it returns almost to where it was before. Therefore it is necessary to make many pushes, one after the other, to move the child in the uterus. When the head has been got over the brim, place a hand on each side, just above the greatest diameter of the head, and press the head as far down into the brim as you can. Remember that contracted pelvis is one of the causes of transverse presentation; and therefore that if you cannot press the head down into the brim, it is probable that the pelvis is contracted. If, on examination of the pelvis, you find cause to think that this is the reason why you cannot press the head into the brim, and yet that there is not sufficient contraction clearly to indicate craniotomy, perform podalic version

If the head has been got into the brim, and the os uteri is dilated to as much as three-fifths of its full size, rupture the membranes. If the child be lying with its abdomen anterior, after getting the head into the brim, before rupturing the membranes turn the child round so as to get its back in front. By letting off the liquor amnii you enable the uterus to contract upon the fœtus, and drive it, instead of the bag of waters, into the os. Before the os uteri is as large as this, enough of the head cannot enter the os to make it a good dilator.

When you have got the head into the brim in a favourable position, maintain it there by putting on a firm binder. If great obliquity of the uterus persists after the malposition has been rectified, let the patient lie on the side opposite to that towards which the fundus leans. The fundus will then tend to fall towards the side on which the patient is lying, and so to undo the obliquity which may have been the cause of the transverse presentation.

B. *External podalic version* is performed in essentially the same way, the only difference being that instead of pressing the breech up and the head down, you press the breech down and the head up. This operation is seldom done by the external method: because in most cases in which podalic version is performed it is desirable to bring down a foot, and this requires the presence of two fingers in the vagina. Podalic version is therefore usually done by the combined method. But it is practicable, under favourable conditions, to do it by the external method. If the child be lying with the breech in one iliac fossa, it is the best practice to press the breech into the pelvic brim, just as you would the head, if the head be the end which is the lower.

2. **Bipolar version.**—In the great majority of cases requiring podalic version it is possible to turn by the *combined* or *bipolar* method, and when this is possible, it should be the method preferred.

Put the patient either on her left side or on her back. The dorsal position is preferable, but it is unusual, and the patient may not like it. If the patient is anæsthetised she will be saved from pain, and the operator's task will be easier; but the operation can be done without an anæsthetic.

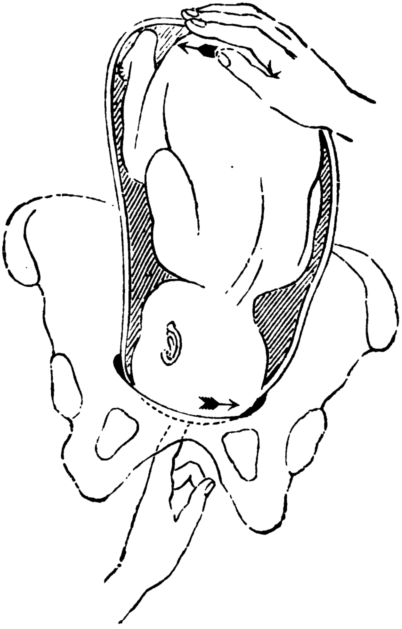

Fig. 136.—Showing Commencement of bipolar Version, with Head presenting. The arrows indicate the direction of pushing. (*After R. Barnes.*)

Bipolar version is sometimes called for when the head presents (Fig. 136), but more often when the shoulder presents. Suppose the child lying with its back forwards, head in left iliac fossa, and right shoulder presenting at the os uteri. Put two fingers of the left hand in the vagina, pass them up through the os uteri on to the child's shoulder. Place the right hand on the mother's abdomen, over the breech of the child; now with the two fingers of the left hand press the shoulder upwards, forwards, and to the left, at the same time pressing the breech downwards, backwards, and, until the child's body becomes transverse, towards the right (Fig. 137). If the membranes be not ruptured, and the liquor amnii be not abnormally deficient, these manipulations will move the shoulder away from the os uteri, towards the left, make the head travel upwards, the shoulder to the left, and the breech down.

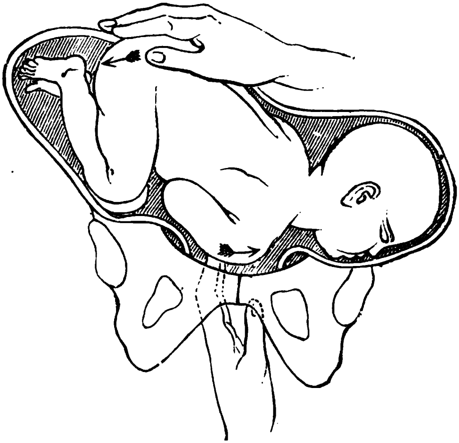

Fig. 137.—Showing Commencement of bipolar Version with Shoulder presenting (second stage of version when head presents). (*After R. Barnes.*)

The vaginal fingers will then come upon the ribs instead of the shoulder. Using a rib as a point of support for the fingers, push the chest along to the left, helping the movement with the hand outside. The trunk of the fœtus being thus pressed along from right to left, the next part of it felt will be the iliac crest, and then the fold between the thigh and the belly. When these parts are felt, press the iliac bone upwards and forwards instead of to the lett, at the same time pressing the left side of the breech with the external hand backwards and downwards. Thus you will get the abdominal surface of the fœtus to look more downwards, and be able to pass your fingers along the thigh to the knee (Fig. 138). When you can feel the knee, press the child's body strongly down with the external hand, so as to bring it more within reach of the vaginal fingers. Then hook a finger over a knee, and draw it to the os uteri. Place a finger on each side of the leg, and move them down to the ankle. Grasp the leg with two fingers, either one above each malleolus, or one above the heel and one over the front of the ankle, and pull it down through

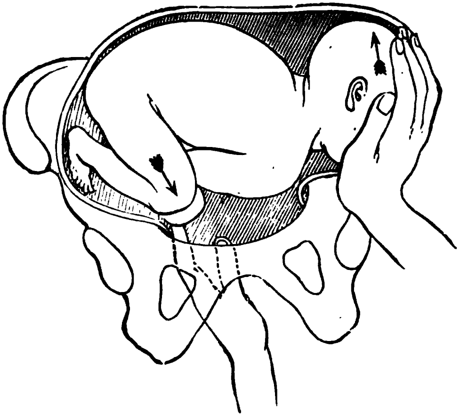

Fig. 138.—Showing Continuation of bipolar Version: seizure of knee (*After R. Barnes.*)

the os uteri (Fig. 139). In doing this the membranes will be ruptured, if they have not already been torn in hooking down the knee or in grasping the foot.

If the membranes have been ruptured, the mode of operating is the same, but the child will be moved with more difficulty. Although it may be possible to move the shoulder, yet the movement imparted to the head may simply move the uterine wall instead of the head moving within the uterus. If this be so, place the outside hand on the left iliac region over the head, and when the fingers in the vagina move the shoulder, press the head up with the outside hand. At the same time get an assistant or the nurse to press down the breech. If you cannot succeed in this

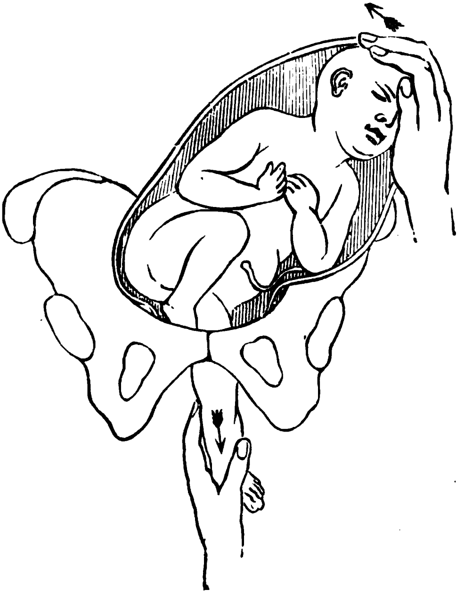

Fig. 139.—Showing final Stage of bipolar Version: bringing down a leg (*After R. Barnes.*)

way in moving the head, the case is one not for bipolar, but for *internal* version.

3. **Internal version.**—Put the thumb and four fingers together into a cone. Lubricate the whole hand with glycerine of sublimate, and pass it into the vagina. Then separating the fingers and thumb so as to make the hand flat, pass it up along the ventral aspect of the child. If the arm be not prolapsed, take hold of the arm which is the lower, bring it down, and put a noose of tape round it. Then pass up your hand again along the ventral aspect of the child, grasp the knee, and pull it down (Fig. 140). Then slide your grasp down the leg to the foot, and bring it down. Now draw on the foot, at the same time that with the hand on the abdomen you press up the head. In a case at which the operation has been done at the right time, the head will rise as the other extremity of the fœtus is pulled down. When you have got the breech into the pelvis, deliver just as in a breech presentation. The possible difficulties in extraction and the way of meeting them are the same as in a breech case,

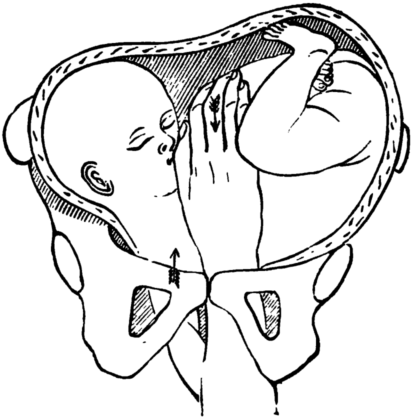

Fig. 140.—Showing internal Version. (*After R. Barnes.*)

except that trouble in bringing down the arms is avoided, because the noose you have put around the lowermost arm enables you to pull that down without difficulty.

All the manipulations of *turning* should be done *in the intervals* between the pains: when a pain comes on, desist. The reverse rule applies to *extraction*: when doing this, pull *during* the pains; leave off in the intervals.

Which leg to seize. — There has been some discussion as to *which leg to seize.* For many generations no one troubled about it; accoucheurs took the first they laid hold of. Then it was urged as being important that the leg seized should be the one opposite to the presenting shoulder, because, it was said, the child then underwent a more complete change in position, and the shoulder was more effectually raised out of the pelvis. It was assumed that the child rotated about an axis running from side to side. Thus supposing the child to be lying with its abdomen in front and its right shoulder presenting, it was assumed that by pulling down the left leg the left side of the body was drawn down with that leg, the right side of the body was made to ascend with the right arm, and thus not only was the leg brought down, but the back was brought in front. It was said that if now in such a case the right leg were seized, the child rotated about an axis running from before backwards: that is, the right leg was pulled down and the right arm rose up, but the child's abdomen remained in front. This theoretical effect of seizing the leg opposite to the presenting shoulder led some, while allowing that the seizure of the lower leg was right when the back was in front, to teach that the opposite leg should always be taken when the abdomen was in front.

This teaching has been shown to be erroneous. Firstly, in practice it is not only easier to reach the leg on the same side as the presenting arm than the other leg, but easier to turn the child when this leg has been seized. Secondly, when the abdomen is in front and the leg opposite to the presenting shoulder has been brought down, the abdomen is often still in front, showing that the supposed complete rotation of the child's body about an axis running from side to side does not always take place. Thirdly, it is not

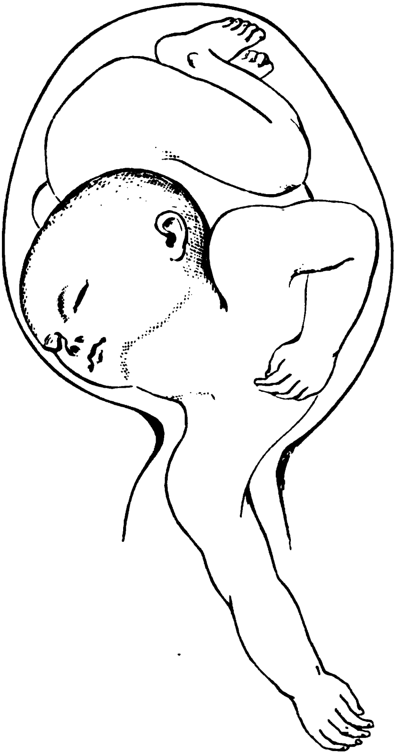

Fig. 141.—Showing Fixation of Shoulder below Os Internum.
(*Drawn by Dr. W. A. Kibbler.*)

N.B.—This figure shows the usual position of the child in transverse presentations more accurately than any of the preceding ones. Observe that the long axis of the uterus is but little altered in direction.

important that it should take place; for the leg that has been brought down will always during delivery move to the front, no matter what was the position of the child at the time the leg was brought down. Galabin* has shown that there is a distinct mechanical advantage in version by the leg on the same side as the presenting part. Practice and theory thus go together in showing that the right leg to seize is the one most easily got at, and that is the leg on the same side as the presenting shoulder.

Difficulty in rotation.—If the membranes have long been ruptured, almost all the liquor amnii will have run away. Then the uterus will closely embrace the child, having become moulded to its shape. If this is the case, you may find that although you can seize a foot, the child does not turn when you pull on the foot. In that case put over the ankle a noose of tape and pull on this, using the hand in the uterus to push up the shoulder and head of the child.

Fixation of shoulder below os internum.—If the shoulder has been driven down before the full dilatation of the os internum, the point of the shoulder may get caught below the os internum, which grips the neck of the child, and then the child cannot be turned in the way described, because pushing the shoulder up only presses it more strongly against the os internum (Fig. 141). If you cannot make the child turn, examine carefully, and if this condition be the cause of the difficulty, you will feel the ring of the os internum. (Possibly this effect might be produced by a retraction ring formed during a long labour *above* the internal os. In the cases I have seen, the ring was not high enough up for this.) If you recognise the difficulty, it is easy to overcome it. Press the point of the shoulder towards the middle line. You will thus disengage it from the impediment which prevented it from rising, and by pulling on the leg you will turn the child without difficulty.

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* Obst. Trans., vol. xix.

CHAPTER XXVII.

OPERATIONS FOR LESSENING THE CHILD'S SIZE.

Indications.—These are contraction of the pelvic canal, either by deformity or by tumours, and excessive size of the child, causing such disproportion between the genital canal and the child, that although a living child cannot pass through the parturient canal, yet a child the size of which has been lessened to the degree possible by the means at our disposal can be safely pulled through it. The diagnosis of these conditions has been described in chapters X., XIV., XVII., and XIX.

Prognosis.—The success of the operation depends upon its necessity being found out *early*, before the patient's tissues have been damaged by the pressure of the child's head upon them during prolonged labour, and before injury has been inflicted by attempts at delivery in other ways. One writer has succeeded, by collecting cases in which the operation was improperly postponed and antiseptics neglected, in showing as its result a mortality of 50 per cent. But the danger to the mother of the operation done skilfully, in the proper cases, at the proper time, and with antiseptic care, is not higher than that of natural labour.

The operations.—The operations by which the size of the child is lessened are, 1, *perforation* of the head, followed if necessary by either (*a*) *craniotomy* or, as it is sometimes called, *cranioclasm*, or (*b*) *cephalotripsy;* 2, *evisceration*, which means emptying the chest or belly; 3, *decapitation*. The two latter may be grouped together under the title of *embryotomy*. Other methods of lessening the size of the child have been invented, such as basilysis, which is breaking up the base of the skull by a sort of large gimlet called a basilyst; cutting the head into sections with a chain saw or steel wire; but none has been shown to have any advantage over those commonly in use. I shall only describe those which experience has shown to be the best.

Perforation.—Perforation is the first step in lessening the size of the child's head. You cannot crush the child's head until it has been perforated, on account of the resistance of its contents.

The perforator.—The best perforator is Oldham's (Fig. 142). It, like most perforators, consists of two pieces jointed together so that they form a sharp-pointed head, mounted on a strong handle so made that after a hole has been made by the head of the instrument the two halves can be separated and the hole enlarged. Oldham's perforator is straight; a curve is unnecessary, and gives a tendency to slip. Some perforators have the whole of the point attached to one blade, the other being truncated. This is not an improvement. Some perforators are made with scissor-handles, others with handles kept apart by a spring or bar; but these are inferior in strength, simplicity, and convenience to Oldham's. You cannot hold the scissor-handles so well. The instrument in which the handles are kept apart by a spring or bar obliges you to take away the fingers which are informing you of the position of the point, in order to unfix the spring or bar. In choosing an Oldham's perforator, see that the distance between the handles fits the size of your hand.

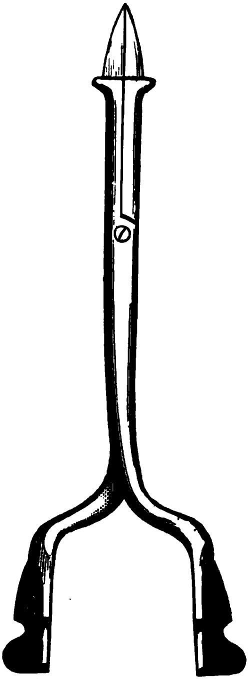

Fig. 142.—Oldham's Perforator.

Where to perforate.—Some writers have advised perforation through the bony vault; others through a suture or fontanelle. It takes a little longer to get through a bone, but the hole made in a bone remains open; it does not get stopped up by a valve of membrane. It is easier to get through a fontanelle; but the margins of an opening made through membrane may fall together enough to impede the free exit of brain matter. Therefore if you have a proper instrument perforate through the bone. If you have not got with you a perforator, you can make an opening through a suture or fontanelle with pocket-knife or scissors.

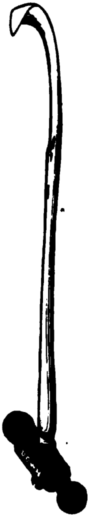
Fig. 143.—Crotchet.

How to perforate.—Ascertain the position of the cervix uteri. Place two fingers on the most advanced part of the head so that their backs may be in contact with the cervix, if it be not retracted. Then pass up the point of the perforator in the recess between the palmar surfaces of the fingers. When it strikes the head, with a combined pushing and boring movement push it through the skull up to the shoulder of the instrument. Then separate the blades so as to make a free opening. Close the blades again, turn the instrument through a right angle, and make another free opening. Now take the crotchet (Fig. 143), put it in through the hole, and break up the brain, taking especial care to destroy the medulla oblongata. The crotchet is best for this purpose, for if you use the perforator its point is apt to catch in the dura mater. If you do not break up the medulla, the child may breathe and cry after it is born, although the upper part of its brain has been broken up.

Methods of extraction.—Extraction, after perforation, is done with one of two instruments: (*a*) the *craniotomy forceps,* which is also called the *cranioclast*, and (*b*) the *cephalotribe.* In different books you find different opinions, some writers thinking that for one who has a cephalotribe the craniotomy forceps is unnecessary; others that the cranioclast has made the cephalotribe obsolete. The truth is that it is hardly possible for the two instruments to be compared; for the results attained depend more on the skill and practice of the operator than on his instrument. Cases calling for perforation are not very common. One who has become dexterous in the use of the cephalotribe, and then attempts to use the cranioclast for the first time, is hardly likely to be pleased with it, and is not able to give an unbiassed judgment. *Mutatis mutandis*, the same thing holds of one who has become skilful with the craniotomy forceps, and then tries to use the cephalotribe. Humanity as well as care for his reputation will prevent one accustomed to either instrument from risking injury to his patients for the sake of practice with what will seem to him an awkward instrument.

My own preference is for the cephalotribe in bad cases; but this may be because I have used it so much oftener. It is, I believe, possible in cases of extreme pelvic contraction to deliver through a slightly smaller space with the craniotomy forceps than with the cephalotribe. In slight cases the craniotomy forceps is easier to use. I advise you not to get both, but to choose one, learn to use it well, and keep to it.

A. **The craniotomy forceps or cranioclast.**—This is used for one of two purposes:—

1. In slight cases to pull.
2. In bad cases to break up the cranial vault.

The instrument.—The craniotomy forceps consists of two separate blades united by a lock. The English lock is the best (Fig. 144). In many instruments the blades are joined by a pivot fitting in a slot (Fig. 145). The blades have a curve roughly corresponding to that of the fœtal head, and are serrated, the outer on its concave, the inner on its convex surface, and when locked the serrations should fit into one another.

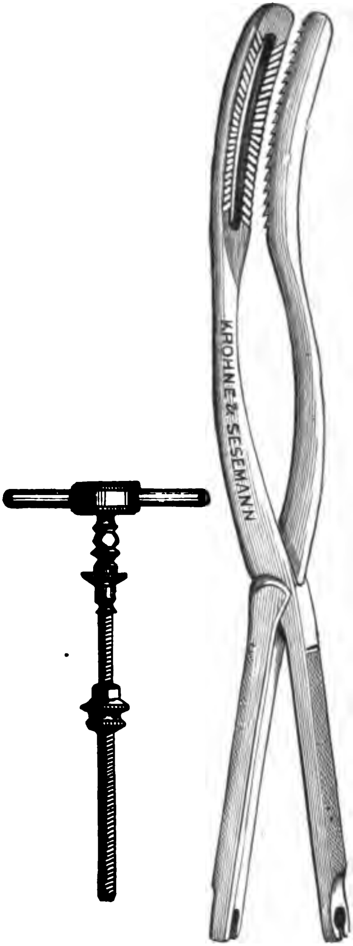

Fig. 144.—Roper's Craniotomy Forceps, with English Lock.

The two blades, when pressed into contact, are so shaped that between the serrated part of the blades and the lock there is an interval at which they are separated, in which a fold of the scalp may lie which would otherwise interfere with approximation of the serrated surfaces. The handles are undulated on the surface, and can be pressed together by a screw, which should be hinged to one blade; for it is inconvenient to have to hunt for the screw when you have got the blades into position. This when screwed home should bring the blades into close contact.

Its use. 1. **Pulling.** — After perforation, pass up the outer blade over one of the frontal bones between the scalp and the cervix uteri. Put the inner blade into the hole in the skull, and lock it with the outer; then screw the handles together as tightly as you can. If the instrument is well made, you have now a firm grasp of the head. All you have to do is to pull. If you do not succeed, take off the instrument and apply it again, this time over the occiput or over a parietal bone. The diameter of the incompressible base of the skull is from three inches to three inches and a quarter, measured either between the mastoid or the zygomatic processes. If the base of the skull be tilted towards either shoulder, so that the two ends of its transverse measurement do not engage in the brim at the same time, it can easily come through a brim of two inches and a half; and the vault of the skull will readily collapse to this extent under pressure. Therefore if the conjugate is two inches and a half or more, and the other diameters not greatly contracted, it is not necessary to break up the cranial vault; it is enough to perforate, seize the head, and pull. The pressure of the pelvic bones on the head will

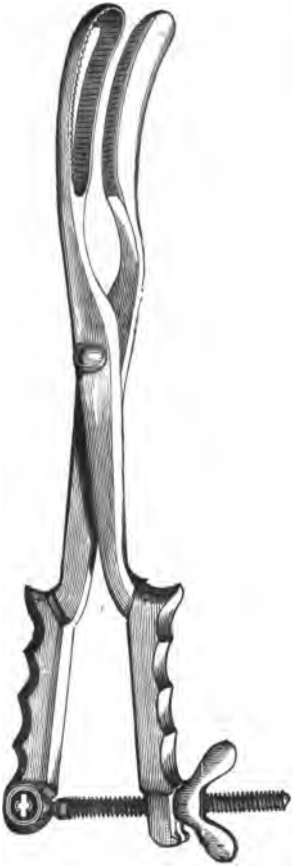

Fig. 145.—Craniotomy Forceps with Pivot and Slot, and Screw attached.

give it the needful obliquity, press together the bones of the vault and press out the brain substance. In cases of slight contraction, delivery in this way with the craniotomy forceps is easy.

2. **Cranioclasm.**—If the pelvis is smaller than this, it will probably be necessary to do more—to break up the cranial vault: that is, *cranioclasm.* The word "probably" is inserted because the necessity for the operation is conditioned not only by the size of the pelvis, but the size and degree of ossification of the head. If the head be small and soft, it can be dragged through a smaller brim than one having a conjugate of two inches and a half.

If cranioclasm is needed, push the outer blade up *between* the scalp and a cranial bone. Put the inner blade through the hole into the skull. Lock the blades, and screw them tight. Now sharply twist the instrument, first one way, then the other, so as to break off the bit of bone in the grasp of the instrument. This done, withdraw the instrument, with the bone in its grasp, guarding it with the fingers of your left hand to prevent splinters from scratching the vagina. In this way seize, break off, and extract pieces of the parietal, frontal, and occipital bones. Having so broken up the vault of the skull that the fragments of the bones which remain will lie flat against its base, put two fingers of the left hand into the vagina, and the right hand outside, and by their combined operation change the position of the head till the face is over the brim. As soon as this is done, take the vertebral hook (Fig. 146), and fasten it either in the mouth, behind the palate or lower jaw—or in the base of the skull, behind the clinoid processes or in the foramen magnum—and thus draw down the face into the brim. If there is difficulty in thus dragging it

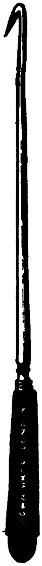
Fig. 146.—Oldham's Vertebral Hook.

through, hold the face in the brim with the hook in the mouth, and then apply the cranioclast with one blade under the chin, the other above the base of the skull, and screw it up as tightly as you can, to crush as much as possible, and get a firm grip (Fig. 147);

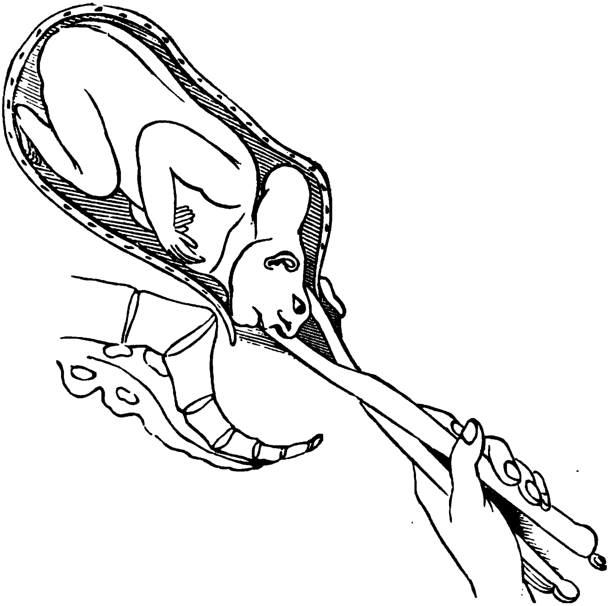

Fig. 147.—Showing the Base of the Skull seized by the Craniotomy Forceps Face first after Removal of the cranial Vault. (*After R. Barnes.*)

and then, with hook and forceps, pull the face through (Fig. 148).

This is, in my judgment, a more difficult and tedious operation than cephalotripsy, but those who have used the cranioclast much say, that in this way a head can be got through a smaller brim than the smallest through which a cephalotribe will deliver.

B. The cephalotribe: the instrument.— I think this the easier instrument to use. The best cephalotribe is that of Dr. Braxton Hicks. It is formed of two powerful nickel-plated steel blades, thick enough not to yield, but lightened by being grooved longitudinally on the interior. The handles are approximated by a screw. The shanks should for lightness be flattened in the direction contrary to that of the strain on them, thick in the plane parallel to the length of the screw (Fig. 149). There

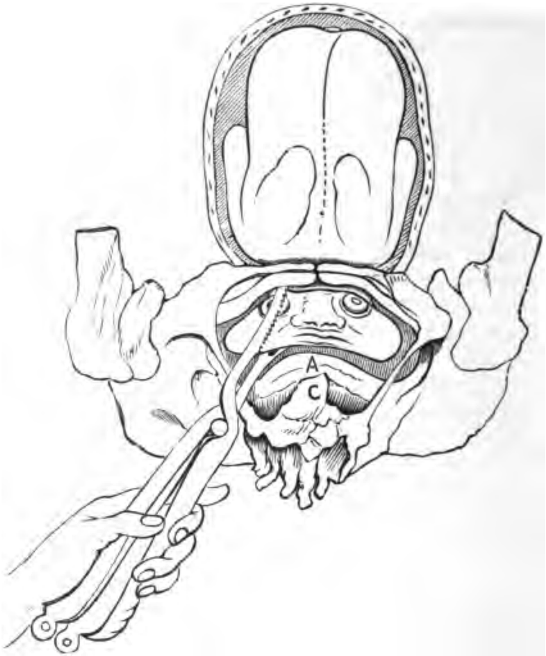

Fig. 148.—Showing the Base of the Skull being drawn through the Brim Face first. (*After R. Barnes.*)

A, Promontory of sacrum; C, coccyx.

should be no spikes, studs, or other contrivances to hold the head on the inside of the blades; such projections hinder introduction and are unnecessary; for the head is held by the approximation of the ends of the blades. The incurved tips, when the blades are closed, should meet. The greatest external measurement, when the blades are closed, should not exceed an inch and a half.

Its use.—The cephalotribe is introduced (after the head has been perforated) in the same way as the forceps: the lower blade first, then the upper. It is of the first importance that the blades should seize the head opposite its greatest diameter. If the blades lie in front of or behind the equator of the head, when they are screwed together they will slip forwards or backwards, as the case may be. To make sure that they are opposite the greatest diameter of the head, feel for the ends of the blades with the hand on the abdomen. You can easily feel them through the abdominal wall,

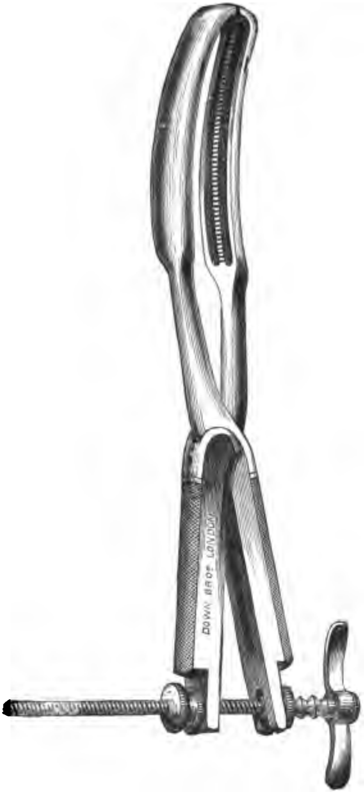

Fig. 149.—Hicks's Cephalotribe.

and find out how they lie with relation to the head If they have not rightly seized the head, move the handles backwards or forwards as may be necessary. When the blades are in the right place, apply the screw and tighten it (Fig. 150). While screwing up, put the hand on the abdomen from time to time, to be sure that no slipping is taking place. When you have had some practice you will find this unnecessary, for you

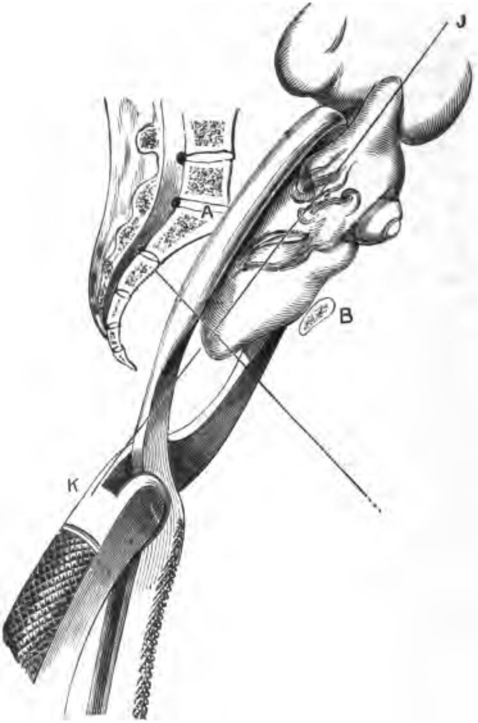

Fig. 150.—Showing the Cephalotribe applied. (*After R. Barnes.*)
A, Promontory; B, symphysis; J K, axis of brim.

will know whether the head is rightly grasped or not by the resistance to the approximation of the blades. If as you work the screw the blades come together easily, they are slipping. If they are rightly in place, the more you tighten the greater will be the resistance.

Extraction.—When you have screwed the blades home—that is, as tightly as you possibly can, begin to extract. The commonest pelvis calling for cephalotripsy is the flat rickety pelvis. Here the narrowing is in the conjugate. You have crushed the head in the transverse diameter. Turn the instrument through a quarter of a circle, so as to get the crushed part of the head into the narrow part of the brim. Extract by steady traction. Take care not to hold the instrument so rigidly as to prevent the head from accommodating itself to the shape of the brim. If the head does not come down easily, vary a little the line of traction from time to time in order that the shape of the crushed head may accommodate itself to that of the brim. With a good cephalotribe extraction through a flat pelvis having a conjugate of two inches is easy.

Evisceration. — The operation of opening the child's chest or abdomen need not detain us long. It is best done with a pair of strong scissors. They need not be very long; a length of eight inches is quite enough. The blades should be straight, for curved blades are difficult to keep sharp. They should be at an obtuse angle (on the flat) to the handles, so that the hand working them may be out of the way of the hand guiding them. Suppose that the case is one of enlargement of the child's body, preventing it from passing. Let an assistant pull on the legs, so as to get the part offering resistance as low down as possible. Pass two fingers of the left hand up to the enlarged part of the child, with their dorsal surface against the pelvic wall. Then pass up the scissors along the palmar surface of the fingers, and snip through the abdominal parietes. When you have made an opening, insert your fingers, grasp with them whatever viscus seems to hinder progress, pull it down, and cut it away.

Decapitation. *Indications.*—This operation is called for chiefly in cases of transverse presentation in which the liquor amnii has run off, and therefore turning is difficult; and either (*a*) the child is dead, and you ought not to expose the mother to the slightest risk for the sake of delivering it unmutilated; or (*b*) the uterus has passed into a state of tonic contraction, the lower uterine segment is pulled up, stretched, and thinned, and the vagina is pulled up and made tense: so that if you try to turn, the additional tension of the genital canal which putting in your hand causes may lead to its rupture. When the child lies transversely and is forced down into the

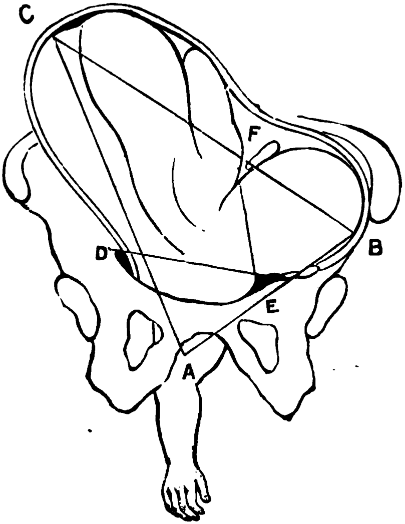

Fig. 151.—Showing Wedge-like Impaction of Shoulder Presentation. (*After R. Barnes.*)

A, Point of wedge; B C, base of wedge; D E, brim of pelvis; E F, line of incision to break up wedge.

pelvis, it forms, as R. Barnes clearly puts it, a wedge, the base of the wedge being formed by the head and pelvis of the child, the apex of the wedge being the presenting shoulder (Fig. 151). By cutting through the neck you break up the wedge, and delivery becomes easy.

Decapitation is also called for in certain cases of *locked twins.* When the delivery of the child which is in advance is impeded by the pressure of the other child on its neck, the way to effect prompt delivery is evidently to divide the neck. The partly-born child is the one least likely to be born alive, and, therefore, the one to be sacrificed. The modes of locking have been described in chapter IX.

The instrument.—The best instrument is Ramsbotham's sharp hook. It should have a cutting, not a serrated edge. Cases requiring its use occur so seldom that you may be years in practice before you have used it often enough to blunt its edge. The next best instrument is a strong pair of scissors. Sawing through the neck with a piece of whipcord, as is sometimes recommended, is a tedious process.

Its use.—I shall describe the operation as it is done in a case of shoulder presentation. If the arm be not already down, bring it down. Let the nurse take hold of it with a napkin, and pull it down as much as possible, so as to bring the neck within reach. Ramsbotham recommended first putting a blunt hook over the neck with which to pull it down, and then applying the sharp hook by the side of the blunt one. If you can feel the neck well with your fingers, pass the sharp hook over it at once; but if the neck is so high up that you cannot confidently guide the sharp hook over it, follow Ramsbotham's advice, and pull it down with a blunt hook. If you do this, there is no need for anyone to pull on the arm. Pass up two fingers with their palmar surface to the back of the child's neck, their dorsal surface to the pelvic wall. Introduce the hook with its flat surface between these fingers and the child's neck. When the end of the hook is above the neck, turn the hook round, and depress it so that its concavity may encircle the neck (Fig. 152). Move the guiding fingers round to the front of the neck, and feel the point of the hook, so as to be sure that the hook is over the neck. This being certain, move the hook quickly backwards and forwards, at the same time pulling strongly down. The sharp hook properly applied will cut through the neck in time measurable by seconds.

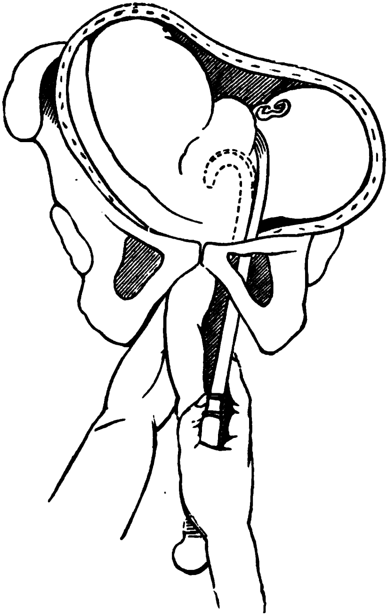

Fig. 152.—Decapitation. (*After R. Barnes.*)
The dotted line shows mode of introducing hook.

If you have not a sharp hook, or if you fail with the sharp hook, as occasionally happens, probably from faulty application, pull down the neck with a blunt hook, pass up two fingers, and, guarded by them, a strong pair of scissors, such as you carry for embryotomy, and with them cut through the neck by repeated snips, each snip being short so that you can be sure what you are cutting through.

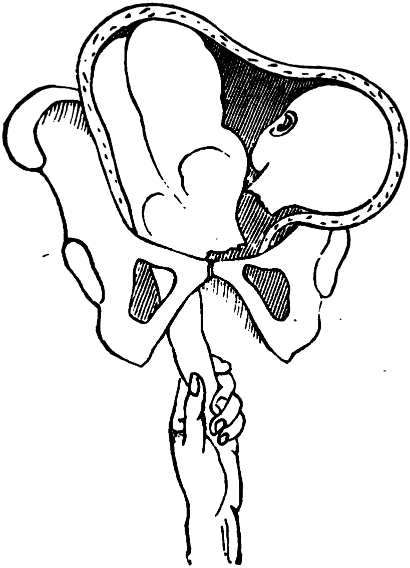

Fig 153.—Decapitation: extraction of trunk. (*After R. Barnes.*)

Extraction after decapitation.—When you have cut through the neck, pull on the arm. The child's body and legs will be delivered easily (Fig. 153). Deliver the head either with the (*a*) cephalotribe or (*b*) craniotomy forceps; for this purpose the latter is the easier instrument to use. (*a*) With the cephalotribe. Put one hand (or two fingers may be enough) in the vagina, the other hand on the abdomen. By the combined use of the two hands turn the head until the face is downwards. Now put the crotchet, or the vertebral hook, into the mouth, and hook it behind the palate or the lower jaw. Having thus got the head fixed in the brim, apply the cephalotribe, and extract with it just as in a case in which the head is presenting. The brain matter will escape through the foramen magnum. (*b*) With the craniotomy forceps. Turn the head round by the combined use of the two hands, until part of the cranial vault is over the brim. Then get an assistant, or the nurse, to press it down on the brim by two hands applied on the abdomen. While it is thus held down, perforate it. Then apply the craniotomy forceps—first a blade outside the skull, then the other in the hole made by the perforator. Screw the blades up as tightly as you can, and pull.

Division of the vertebræ elsewhere than in the neck has been advised, under the name *spondylotomy;* but decapitation is easier and more effective for the purpose of delivery.

CHAPTER XXVIII.

CÆSARIAN SECTION.

The indications for Cæsarian section.— These are of two kinds: absolute and relative. *Absolute* indications are conditions which make delivery in any other way impossible. *Relative* indications are conditions in which it is possible to deliver in other ways, but it is judged that Cæsarian section is the best, though not the only way.

The **absolute indications** are pelvic deformities and solid fixed tumours in the pelvis, narrowing the space through which the child has to be delivered. Fluid tumours do not make Cæsarian section necessary, for they can be tapped and the fluid let out. Nor does scar tissue, for this can be cut open with a knife. Nor do movable tumours, for they can be pushed out of the way.

When the room for the passage of the child is in its smallest dimension less than two inches, Cæsarian section is absolutely necessary. It may be absolutely indicated when the smallest diameter is larger than this. Whether or not depends upon the degree to which the space is encroached upon in more than one direction. The common form of pelvic deformity which in Great Britain calls for Cæsarian section is the flat rickety pelvis, and in this pelvis the conjugate diameter is the one most contracted. There is generally so much room in the transverse diameter that if the conjugate be over two inches delivery can be effected with the cephalotribe or craniotomy forceps. It is only in this common deformity that such a simple rule of measurement can be laid down. In other forms of pelvic deformity, or in tumours blocking the pelvic cavity, you must measure the available space in all its diameters, and judge of the amount of injury which will be inflicted in trying to drag the child through. The rarer forms of contracted pelvis and the possible sizes and shapes of solid fixed pelvic tumours, alter the size and shape of the pelvic canal in such divers ways that it is not possible to lay down absolute measurements. As a general rule, a space of 2 × 4 inches represents the minimum through which it is prudent to attempt delivery by craniotomy.

Relative indications.—Cæsarian section may be relatively indicated when in a flat pelvis the conjugate diameter is more than two inches, but less than three, or in a small round pelvis less than three inches and a half. When the conjugate is above these dimensions, it is possible that the child may be born alive. If it is between the dimensions stated, the mother can be delivered, by sacrificing the child, with no greater risk than that of normal labour. If we look solely at the immediate risk to the mother, craniotomy must clearly be the choice.

But there are other considerations which may incline us to choose Cæsarian section. If the patient can be received into a good hospital, everything prepared beforehand, and the operation done by an experienced abdominal surgeon at an appointed time, the risk is small—not greater than that of an ordinary ovariotomy. At the time of operation the patient can be sterilised by removing her Fallopian tubes; while after delivery by craniotomy she is exposed to the troubles and risks of subsequent pregnancies with the prospect either of repeated craniotomies or of premature children difficult to rear. If Cæsarian section is done, the patient will have as large and strong a child as she can produce. If the delivery be hindered by a fibroid, delivery of the child by Cæsarian section can be followed by removal of the ovaries, which will put an end to the activity of the tumour. If the patient is the subject of osteomalacia, this disease can be cured by removing the ovaries.

Post-mortem Cæsarian section. — Lastly, Cæsarian section is sometimes required after death. When a pregnant woman dies undelivered, experience has shown that the fœtus may live as long as 25 minutes after the mother. Therefore when a pregnant woman dies undelivered, from a cause—such, for instance, as a fall, a burn, a crushed chest, or a fractured skull—which does not affect the vitality of the fœtus, the medical attendant ought to open the abdomen as soon as it is certain that the mother has breathed her last, in order that the child's life may be saved.

Time of operating.—Some think it important to postpone the operation until labour has begun, for the reasons (1) that the uterus contracts better after labour has commenced, and (2) that the dilatation of the cervix ensures free escape of the lochia. I do not know of any proof that hæmorrhage is more likely to occur when the operation is done before the beginning of labour than when after it. The advantage of doing the operation at a place and time which make it certain that you will have skilful assistance, good light, and every needful preparation, far outweighs the doubtful liability to hæmorrhage. It is possible, however, by putting a bougie or a tent in the uterus, to start labour pains, and yet operate at a pre-arranged time; and therefore this should be done. If labour pains do not come on by the appointed time, and the operation can be postponed without forfeiture of the advantage of your preparations, postpone it; but operate without labour pains rather than incur the risk of operating in unfavourable circumstances.

Preparations.—The patient should be put on a narrow table, with her abdomen uncovered; her chest and legs protected by warm clothing. Macintoshes should be arranged so as to protect the coverings of the chest and legs from being wetted. The position of the child should be ascertained by abdominal palpation, so as to avoid spending time in searching for the knee. The bladder should be emptied. The abdomen should be washed with soap and water. and the pubes shaved, to prevent the after-dressings from sticking to the hair. Sponge and rub the abdominal wall with 1 in 1,000 sublimate solution. Lay folded towels, wrung out in 1 in 1,000 sublimate, above, below, and on each side of, the area in which the incision is to be made.

Four assistants are required: one to give an anæsthetic; one to sponge; one to press out the uterus and keep the bowels back; and one provided with scissors, thread, and a flannel receiver, to attend to the baby.

Instruments required.—A scalpel. Scissors. Dissecting forceps (those sold as "conjunctiva forceps" are most convenient). Six small pressure forceps. Six large pressure forceps (which form the best sponge-holders). Eighteen pieces of No. 5 China twist, each piece eighteen inches long, for the deep uterine suture and the wound suture. Twenty-four half-curved No. 1 needles; eight pieces of China twist to be each threaded on two needles (for the abdominal wound suture), and eight each threaded with one needle (for the deep uterine stitches). A smaller number of needles will do if the ones first used can be threaded again by the nurse during the operation. A No. 6 half-curved needle, threaded with three feet of No. 1 catgut (for the peritoneal uterine suture). One large flat sponge, and twelve round sponges: clean and aseptic. Gamgee tissue. Iodoform. Binder. Sublimate solution for the hands. In case it should be necessary to finish the operation after the method of Porro, have ready either Lawson Tait's clamp, Kœberle's serre-nœud, or two feet of indiarubber tubing and two knitting needles.

The operation: opening the abdomen.—The patient having been anæsthetised, make an incision in the middle line, about six inches long, extending from a little above the umbilicus to within about two inches of the symphysis pubis. The harm arising from making the incision half an inch too long is less than that from too short an incision. Cut through the skin and subcutaneous fat, down to the fascia forming the white line. Secure all bleeding points with pressure forceps. Then cut through the white line, and the subperitoneal fat will be seen. Take hold of this with forceps, and pull it up through the wound. Holding the flat of the scalpel parallel with the surface of the abdomen, cut carefully into the tissue pulled up by the forceps, and when the fat has been divided, the peritoneum will be seen. Make the opening in the peritoneum big enough to admit the finger. Then put a finger through the opening, into the peritoneal cavity; and, using the finger as a director, complete either with knife or with scissors the division of the peritoneum and the rest of the white line throughout the whole length of the wound.

Opening the uterus.—Now let an assistant with a hand on each side press the abdominal wall back and against the uterus, so as to make the wound gape and prevent fluid getting into the belly. This done, quickly cut into the uterus in the line of the abdominal wound, and for nearly the same distance. If the placenta be implanted at the site of incision, cut through that too. The uterine wall will bleed freely while it is being laid open, and if the placenta is here attached, the bleeding will be greater. Therefore cut through the uterus (and placenta, if needful) as quickly as you can.

Extraction of child.—You will know the position of the child from your examination immediately before the operation. Seize the nearest knee, and extract the child. Hand it to the assistant waiting for it. It has been recommended to extract the child head first, because the uterus may contract round the neck, and so hinder the head from coming out. The way to prevent this is to make a long enough incision before you begin to extract. The knee gives much the best hold.

Immediately after the child has been extracted, the assistant who has been keeping the abdominal walls applied to the uterus should press them back behind the uterus, so as to turn it out of the abdomen. The diminution in the contents of the uterus by the escape of the liquor amnii and removal of the child will be followed by contraction, so that the uterus will become small enough to pass out through the incision. If this contraction is delayed, the pressure of the assistant's hands will hasten it. When the uterus is outside, the assistant should press the abdominal walls together behind it, so as to prevent the bowels from getting out.

Extraction of secundines.—Now put your hand in the uterus, detach and remove the placenta and membranes. You will probably find part of the placenta already detached. Take care to remove the whole of the membranes. Now swab the inside of the uterus with a sponge soaked in 1 in 1,000 sublimate solution. If the uterus does not contract well, and there is hæmorrhage, compress it until it does contract. Remember that the cut uterine wall bleeds, and that nothing but suture will stop this. Make the uterus contract, and then suture it; but do not postpone the suturing till all bleeding has stopped.

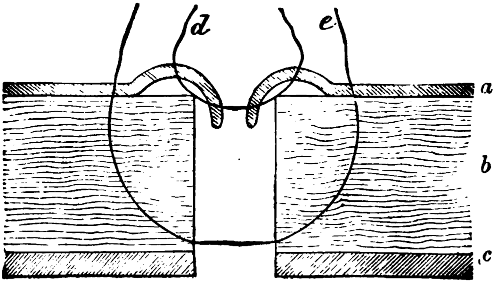

Fig. 154.—Showing Position of Sutures in relation to Structures in Uterine Wall. (*After Galabin.*)

a, Peritoneum; *b*, uterine muscle; *c*, decidua; *d*, superficial suture; *e*, deep sutures.

Deep sutures. — The uterus being retracted, suture it. Put in first from six to eight deep sutures at intervals of from two-thirds of an inch to an inch apart. Take a needle threaded with No. 5 china twist. Enter each suture on the peritoneal surface about half an inch from the edge of the incision. Bring it out through the cut uterine wall near the inner surface, but not including any part of the inner decidua-covered surface (Fig. 154). Enter it again on the corresponding spot of the cut uterine wall at the opposite side, and bring it out on the peritoneal surface about half an inch from the cut edge. Tie each suture at once. In tying the suture, tuck in the peritoneal edges so that the pull of the knot may bring peritoneal surfaces into contact.

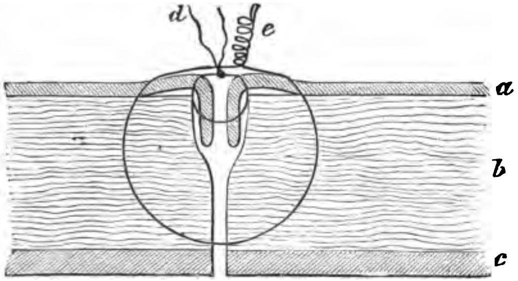

Fig. 155.—Showing the Sutures when tied: peritoneal surfaces being brought into contact by the superficial sutures. (*After Galabin.*)

a, Peritoneum: b, uterine muscle; c, decidua; d, superficial suture; e, deep suture.

Superficial sutures.—Use for these a thread about three feet long of fine silk or No. 1 catgut. Enter the needle on the peritoneal surface, about one-third of an inch from the line along which the deep sutures have brought the peritoneal surfaces into contact. Bring it out through the peritoneum, close to this line. Enter it again close to this line on the other side, and bring it out about one-third of an inch from it (Fig. 155). Knot the first suture, cut off the short end, and then sew up the whole line with a continuous suture, each stitch being put in as described, and about a quarter of an inch from the one preceding. In putting in each stitch, before pulling out the needle put the thread outside its point, making thus what seamstresses call the "button-hole stitch" (Fig. 156). This will prevent the sutures from lying obliquely. The advantages of this continuous suture are, that it is put in more quickly, thus considerably shortening the operation, and that there are fewer knots and ends to be covered with lymph and absorbed (Fig. 157).

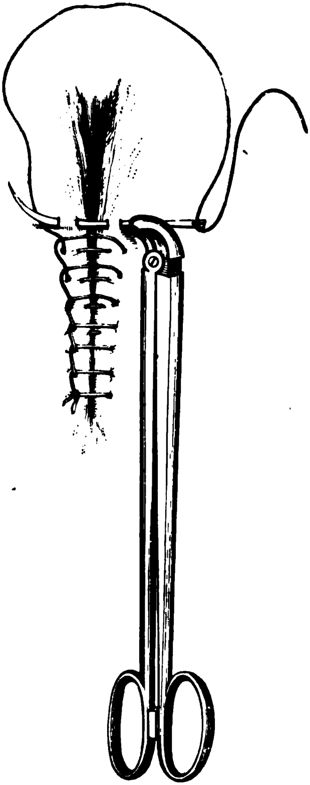

Fig. 156.—Showing the "Button-hole" Stitch.

Peritoneal toilette.—While the uterus is being sutured, if the lustre of its peritoneal surface gets dull (from death of the epithelium or from adhesion of fibrin from the blood or foreign matter from the air) pour warm water over it till it is bright again. When the suture is finished, wash the uterus by pouring water over it and by sponging till it is clean, and return it within the belly.

If during the operation any blood or liquor amnii get into the belly (which will not happen if your assistant is efficient), wash out the peritoneum with warm water. It is not necessary to sponge out the cavity; leave the water in it; if it is clean it will do no harm.

Closure of abdominal wound. — Now suture the abdominal wound. This is best done by having on each thread two half-curved needles. Enter each needle through the peritoneum, about half an inch from its cut edge, and bring it out at the corresponding point of the abdominal wall. Put in six or eight stitches, at from two-thirds of an inch to an inch apart. Do not pull them tighter than is needful to secure contact, for tight stitches lead to stitch-hole abscesses. When you have sewn up the wound, dust it liberally with iodoform, put a thick pad of Gamgee tissue on it, and secure this with a binder.

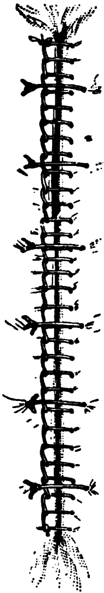

Fig. 157.—Showing Wound closed with deep Stitches and superficial "Button-hole" Stitch.

Müller's modification consists in making a long incision, and turning the uterus out of the abdomen before cutting into it. The supposed advantage of this is, that the abdominal walls being held together behind the uterus, blood and amniotic fluid do not flow into the peritoneal cavity. But if the abdominal walls are pressed close to the uterus, in the manner described, little or no fluid will run into the belly; and whatever does can easily be washed out again. The advantage is very slight, and is more than counterbalanced by the longer exposure of the uterus, and by the more extensive scar, which brings with it a greater liability to ventral hernia.

The elastic ligature.—Another modification introduced by Müller, but not necessarily going with the long incision, is the practice of putting an india-rubber ligature round the cervix and pulling it tight before opening the uterus, so as to stop the circulation through the uterus. The advantage of this is that it makes the loss of blood so slight that the operator can be as deliberate as he pleases. The disadvantage is that the constriction of the cervix and stoppage of the flow of blood to the uterine muscle may impair the contractile power of the latter; and this is a most serious objection. And the slowness in opening, emptying, and sewing up the uterus, which the indiarubber ligature encourages, is not an unmixed gain; for the longer the peritoneum is exposed and handled, the greater the risk of peritonitis. I therefore advise against the elastic ligature.

Cameron's method of using a pessary.—Dr. Murdoch Cameron, of Glasgow, recommends that before the uterus is opened, a ring pessary should be pressed down upon it, so as to press on a circle of tissue around the place where the incision is begun. By this pressure the circulation is stopped, and the beginning of the incision made almost bloodless, so that the operator can clearly see when he has got down to the fœtal membranes. When the incision has been made large enough to admit the finger, the operator can use his finger as a director, and rapidly complete the incision. This ingenious manœuvre may lessen a little the amount of blood lost; but the quantity thus saved is not, if the operator be skilful, very great.

Sterilisation.—If the condition which called for the operation is permanent, it will be well to save the patient the risk of its repetition by sterilising her. This will not add to the danger. The best way of sterilising the patient is not only to tie, but to (*a*) cut a piece out of, or (*b*) to cut off, each Fallopian tube. We know of no ill effect on the health of the patient from this. (*a*) Grasp the tube with forceps midway between the uterine and the fimbriated ends. Pull it up, so that the parts of the tube on each side of the forceps run nearly parallel. Pass the threaded pedicle needle through the mesosalpinx, about an inch below the part of the tube grasped. Put a finger through a loop of the ligature, so as to retain it while you withdraw the pedicle needle. Pass the loop over the forceps and knuckle of tube, and put it between the two ends of the ligature, so that one end is above, one below the loop. Pull the ligature tight, and tie it. Then cut off the knuckle of tube held by the ligature. Do this on each side. Or (*b*) you may cut through the loop, so that you have two ligatures. See that they are interlocked. Then tie one as close to the uterus as possible, the other between the fimbriated end of the tube and the ovary. Then cut away the part of the tube outside the ligature. Experience has not yet shown which of these ways is the better.

Porro's modification.—This consists in Cæsarian section, followed by amputation of the body of the uterus and its appendages, instead of suture of the uterine wound. The advantages of Porro's operation are that it is easier, and gives security against hæmorrhage. The disadvantages are that it brings about a premature menopause, it sterilises the patient (which is not *always* wanted), and when the stump is treated by the extra-peritoneal method it leaves behind it a weak scar at which a ventral hernia is very likely to form.

Porro's operation should be done in the following conditions. First, if, when Cæsarian section has been begun with the intention of suturing the uterus, it is found that the uterus will not retract, the best security against hæmorrhage is Porro's operation. Second, if the operator is inexperienced in abdominal surgery, and is operating in unfavourable circumstances, so that he is not sure of being able accurately to suture the uterine wound. In that case he had better do Porro's operation, which is easier. Thirdly, in osteomalacia. Removal of the ovaries, acting in a way we do not yet understand, cures this disease. When the ovaries have been removed, the uterus is a useless organ. The patient is, therefore, not the worse for losing it as well. In pregnancy, as in enlargement of the uterus from fibroids, the folds of peritoneum forming the broad ligaments become separated and spread out, and contain much larger vessels. It is, therefore, more difficult than in the unimpregnated state to get a good pedicle if the ovaries are removed without the uterus; and the removal of the ovaries as well as suturing the uterus protracts the operation. Therefore it may be better in pregnancy with osteomalacia to perform Porro's operation, which is easier than Cæsarian section.

Methods of operation. — There are many different ways of doing Porro's operation. They are broadly divided into two: the extra-peritoneal and the intra-peritoneal, according to the way of treating the stump. It is not quite certain which method gives the better results. The extra-peritoneal method is very simple. The intra-peritoneal method is very difficult; because unless everything is done with perfect accuracy the patient's life is in danger. Therefore one not expert in abdominal surgery had better not attempt the intra-peritoneal treatment of the stump; and I shall not describe any of its methods.

There are various modifications of the extra-peritoneal method. I shall describe that which is the simplest, requires fewest instruments, and is as good as any other. It is that devised by Mr. Lawson Tait.

Mode of operation. — The instruments needed are as for Cæsarian section, with the addition of a piece of indiarubber drainage-tube, about 2 feet long, and two or three knitting needles. The preliminaries are the same, and the opening of the abdomen is done in the same way. Then with the hand put the piece of tubing as a loop over the fundus uteri, and bring it down so as to encircle the cervix, taking care to keep it close to the uterus in doing so, that a loop of intestine may not be included. Tie the ends of the tube in a single hitch, pull it tight round the cervix, and either give the ends to an assistant to hold, or grasp the hitch with a pair of artery forceps. This will stop the circulation through the uterus. The reason for tying a single hitch only is that should it prove, when you cut into the uterus, that the ligature is not tight enough, it can be pulled tighter immediately. Now incise the uterus. Make an incision about an inch long at the lower part of the body of the uterus; put your finger in it, and extend the opening upwards by tearing. By tearing, you diminish the risk of cutting the fœtus, and also that of hæmorrhage in case your ligature is not tight enough. Extract the child by its foot, and hand it to an assistant. The uterus will now be smaller in bulk. Pull it out of the abdomen, if your assistant has not expressed it. Remove the placenta. Tighten the knot, if it requires tightening, as, owing to the lesser bulk of the uterus, it probably will. When you have pulled it as tight as possible, tie a second hitch, and a third if the second seems not secure. Now push two knitting-needles across from side to side, through the flattened drainage-tube and through the cervix. This done, cut the uterus off about three-quarters of an inch above the knitting-needles. Now wash out the peritoneal cavity, if you think any foreign matter has got into it, with clean warm water, pouring it in from a jug, and pressing it out again until it comes back clean. Leave in it the water that you cannot easily press out. Now sew up the abdominal wound as in Cæsarian section, except that the lowest stitch should pass through the stump, about a quarter or half an inch (according to the thickness of the abdominal wall) below the elastic ligature, as well as through the abdominal wall, so that it may keep the abdominal wall closely applied to the stump. Having closed the abdomen, the main point is to keep the stump dry and clean; dress the stump by thickly powdering it with equal parts of iodoform and tannic acid. The tannic acid will tan the dead tissue, and the iodoform will keep it sweet. Place Gamgee tissue over the line of incision and around and over the stump, and a binder over all. The stump should be dressed daily, the Gamgee tissue changed, the stump and the skin round it dried with cotton wool, and liberally powdered with the iodoform-tannin powder. The part of the stump beyond the ligature will be separated in about ten or twelve days.

CHAPTER XXIX.

SYMPHYSIOTOMY.

In the foregoing chapter the comparison has been made between Cæsarian section, with good prospect of a living child; and craniotomy, which is safer for the mother but fatal to the child.

But lately an old method of treatment has been re-introduced, which seems to combine safety both for mother and child, in those cases in which Cæsarian section was formerly relatively indicated. This treatment is symphysiotomy. Further experience is required before the place of this operation among our resources can be settled.

This operation was devised by Sigault more than a century ago. At that time antiseptics were unknown, and therefore either the patients died or else the parts did not heal properly, and the results were bad.

Lately the operation has been revived—first in Italy, then in France.* It has been done with antiseptic care, and it has been proved that by it children can be delivered alive through pelves so small that otherwise craniotomy would have been required. Its mortality is small, and when proper care is used, union of the divided parts takes place without any bad symptoms.

This operation does not interfere with fertility. Hence it might be required time after time in the same patient. We do not know yet whether if this operation be repeated several times in the same patient the parts will heal each time without making the union of the two pubic bones less firm. We know that most patients leave the hospital without lameness or any other apparent ill consequence of the operation; but we do not yet know whether when the patient resumes a laborious life, she remains free from weakness in the joint. Until evidence is before the profession showing that the operation is without remote detrimental effects, and that it can be repeated in the same patient without ill consequence, I hesitate to recommend its adoption.

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* See Annales de Gynécologie, 1893.

Indications.—By symphysiotomy about half an inch is practically added to the conjugate diameter of the brim. The two pubic bones can be separated about two inches (Fig. 158). Now as upon the average a conjugate of three inches and a quarter in a flat pelvis is the smallest size that will allow a full-time child to pass, it follows that a flat pelvis having a conjugate of two inches and three-quarters is about the smallest pelvis in which it is advantageous to perform symphysiotomy. It is true that sometimes a living full-term child is so

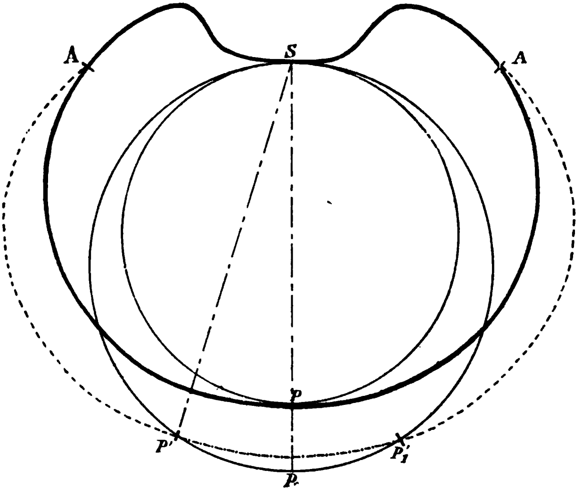

Fig. 158.—Diagram showing Change in Size of Pelvis effected by Symphysiotomy. (*From a Drawing to Scale by Roux and Reynès.*)

Sacro-iliac synchondroses; S, sacral promontory; P, pubes; thick line, contracted pelvis; dotted line A P′, pelvis as enlarged by symphysiotomy; circles (thin lines), size of head that can pass through pelvis before and after symphysiotomy.

small or its head is so soft that it will pass through a pelvis having a conjugate of only three inches; but we cannot count upon this. With a pelvis having a conjugate larger than three inches and a quarter, symphysiotomy may be done if when the os uteri is fully dilated the head will not enter the brim, and cannot be pulled into it with forceps; and if the reason of this is not a malposition which can be corrected, or disease of the head which can be detected, but simply the size and hardness of the head.

Mode of performance.—The time for its performance is when the os is dilated enough for immediate delivery. The patient is put in the lithotomy position, and the mons veneris, labia, and adjacent parts washed and shaved.

The instruments required are a scalpel, dissecting forceps, half-a-dozen artery forceps, a probe-pointed bistoury or a Galbiati's (Fig. 159) or Morisani's knife (a sickle-shaped knife designed for this operation), No. 5 China twist silk sutures, half-a-dozen half-curved needles and a needle-holder; about eight feet of strong adhesive strapping, two inches wide; a strong binder or belt of unyielding material; iodoform gauze, iodoform, Gamgee tissue, antiseptics. The strapping should be cut ready into four strips, each at least two feet long; two of the strips should be cut narrow in the centre, and the other two have a strip cut out in the centre, thus (Fig. 160).

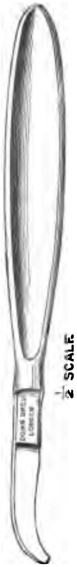

Fig. 159.—Galbiati's Knife.

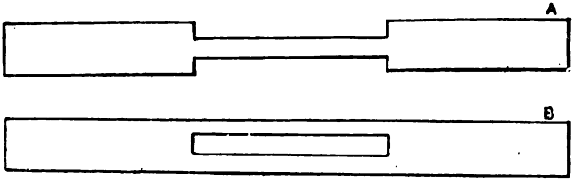

Fig. 160.—Strapping to draw together Parts after Symphysiotomy.

Strips A and B are applied on opposite sides; strip A is passed through B, and thus they can be pulled tight.

Three assistants are wanted: one for the anæsthetic, one to assist in sponging, etc., one to look after the uterus.

Make an incision in the middle line, beginning an inch or two above the symphysis (the precise distance depends on the fatness of the patient), and ending just above the clitoris, that is, so little above the lower border of the symphysis that the lower end of the incision can be pulled down quite to the level of the ligamentum arcuatum. Cut through the skin and subcutaneous fat until the sheath of the recti muscles and the symphysis pubis are laid bare. Secure with forceps any vessels that bleed. Now put the point of the scalpel in the middle line, holding the flat of the blade parallel with the pubic crest, and cut outwards close to the pubes, through the pyramidalis muscle for about half an inch on each side. Lay down the scalpel, and put your finger into the wound behind the symphysis. You will have no difficulty in passing your finger down in the præ-vesical cellular tissue between the bladder and the symphysis. Now comes the section of the symphysis. Some advise that before this is begun a sound should be put in the urethra, and this canal held towards one side before the symphysis is divided. I think this superfluous. A careful operator will not cut the urethra, and a careless one could cut it even if a sound were in it. The section of the symphysis may be made from above downwards, with an ordinary probe-pointed bistoury, or from below upwards, with Galbiati's or Morisani's knife. If the bistoury be used, do not try to divide the symphysis by a forcible cut, but go through by sawing movements, with a gentle pressure against the cartilage; make this pressure especially gentle as you approach the ligamentum arcuatum. Find the place in which to begin your incision by feeling with the finger for the slight depression between the two pubic bones.

If, in cutting, the edge of the bistoury meets with bone, alter the direction of the cutting. Directly you have cut completely through the symphysis the two pubic bones will fly apart without any pulling, and gape half an inch or an inch. By pulling they can be separated farther. Take care not to separate them violently, or more than is absolutely necessary; for the urethra has been lacerated by the separation of the bones. Having divided the symphysis, stuff iodoform gauze into the wound; or powder it with iodoform; or let an assistant sponge it frequently with sublimate solution, to keep it aseptic. Now apply forceps to the fœtal head, and deliver.

Having delivered the child, remove the gauze (if it has been used), and let your assistants press together the two pubic bones. Thoroughly cleanse the wound, powder it with iodoform, and suture the skin wound. Dress it with iodoform powder and Gamgee tissue, and then apply the strapping, two pieces on each side, crossing, as explained above, and pulled as tight as possible. Having made the strapping fast, try to keep the bones still more securely together by putting on the belt or binder as tightly as possible.

While you have been doing this, an assistant should have been taking charge of the uterus, watching the expulsion of the placenta, and the retraction and contraction of the uterus.

The subsequent management of the case is simply that of an ordinary confinement, plus a wound of the pubic articulation. The latter requires the same kind of attention as a similar wound in a person who has not been recently delivered.

The mortality in skilful hands is about 10 per cent., or rather less. But the estimates have so far been based on small numbers of cases; and if performed extensively by persons not familiar with this operation, or with surgical operations at all, it would certainly be higher, and perhaps much higher. As above said, we have not as yet complete knowledge as to its ulterior effect on the joint.

CHAPTER XXX.

THE INDUCTION OF PREMATURE LABOUR.

By this term is meant the induction of labour after the child is viable: that is, after the twenty-eighth week, but before the full term of pregnancy has expired. When we empty the uterus before the child is viable, we call it "*abortion*," not "premature labour."

Indications for the induction of labour prematurely.—These may be divided into five groups:—

1. *Contraction of the pelvis.*—In chapters XIV. and XVI. the diagnosis of this condition has been described and the time defined at which labour should be brought on.

2. *Tumours of the pelvis contracting its cavity.*—Information as to these rare cases will be found in chapter XIX.

3. *Excessive size of the child.*—Sometimes it is found that a woman will in pregnancy after pregnancy produce a child so large that it cannot be born alive, even though the pelvis be not contracted. We do not know the conditions upon which the size of the child depends exactly enough to be able to predict early in pregnancy whether it will be large or small. But if a patient has had a child born dead because it was too big, we can prevent this in another pregnancy by bringing on labour prematurely. In such a case, advise the patient if she finds herself pregnant again to come to you for examination once a fortnight during the last two months of pregnancy. At each visit observe the size of the uterus. Notice how high it reaches in the abdomen; measure the circumference of the belly. Feel the fœtal head with your hands on the abdomen, and try how easily you can press it down

into the pelvis. If, before the patient thinks she has reached term, you find the uterus is as high as the ensiform cartilage, the circumference of the belly (the patient not being fat or dropsical) as large as the average at full term (35 inches); or if you find that the head, when you press it down into the brim, seems quite to fill it, induce labour without waiting for the calculated time to arrive.

4. *Intra-uterine death of the fœtus.* — Certain diseases lead to intra-uterine death of the child. The only ones that have been proved to do this are: *syphilis*, *anæmia*, *cancer*, and *Bright's disease.* There are other conditions which do it, but our knowledge of them is not at present definite. If the child dies *in utero*, you can judge from its size of the date at which death took place. If it happens more than once that a patient's child has died *in utero* shortly before delivery at term, and you cannot find out the cause, you will do well, in order to prevent the recurrence of this calamity, to induce labour shortly before the date at which in former pregnancies intra-uterine death took place. If you can find out the cause of death, and so treat it as to prevent intra-uterine death, that will be better still.

5. *Disease of the mother*, dependent upon pregnancy, or aggravated by it, and threatening the mother's life. This group it is only proper to mention here, for description of these diseases is out of place in a work on difficult labour. Refer to works which treat of the diseases of pregnancy.

Methods.—Many ways of inducing labour have been recommended.

The effective methods may be broadly classified as four:—

1. Separation of the membranes.
2. Irritation of the cervix, to produce reflex contraction of the uterus.
3. Rupture of membranes.
4. Dilatation of the cervix.

Galvanism is useless. Ergot and some other drugs have been recommended. Ergot hastens labour that has already begun, but it will seldom start it. No other drug has been demonstrated to have any effect.

The choice of method depends upon the reason for inducing labour.

Rupture of membranes.—The simplest method is the rupture of the membranes, thereby letting the waters escape. When this is done, uterine action follows, and the other uterine contents are soon expelled. The membranes can be broken with an ordinary uterine sound.

The objection to this method is that it robs us of the natural dilator of the cervix. Labour thus induced is attended with the disadvantages that come from premature rupture of the membranes. Hence, when labour is induced, not because the condition of the mother demands speedy relief from her pregnancy, but, as in cases of contracted pelvis, in order that the child may be born alive, this method is unsuitable. But when labour is induced because the increased tension within the belly is aggravating some disease from which the mother is suffering; or because there is bleeding from the placental site, and it is imperative that the uterus should quickly contract; then, rupture of the membranes is the quickest and surest way of giving partial relief immediately, and complete relief speedily; and this advantage, in such cases, outweighs the disadvantages. Rupture of membranes is the method when it is necessary to lessen the size of the uterus quickly.

In cases in which there is no need for hurry, it is better to use a method which retains for us the dilating bag of membranes.

Irritation of the cervix, in order to provoke reflex contraction of the body, has been used. Two ways have been practised: one is *packing the vagina* either with plugs of soft material such as lint or wool, or with a dilating bag. This is a very uncertain way, and very disagreeable to the patient; therefore I advise against it. The other is known by Kiwisch's name, and consists in the use of a *hot vaginal douche*. The effect of this is sometimes to provoke reflex uterine contractions, and thus to start labour. The douche should be used three or four times a day, for five or ten minutes at a time. No poisonous antiseptic should be used, lest absorption should take place. The water should be at the temperature of 110° F. The douche is better given with a douche-tin than with a syringe; for with this instrument there is no danger of harm from too forcible injection of the stream of water.

This mode of inducing labour is harmless, if the precautions above mentioned are observed. It is cleanly, and not disagreeable to the patient. The objection to it is that it is always slow, and often quite ineffectual. There are better ways.

Separation of the membranes.—A more sure way, and for most cases the best way, is the *separation of the membranes* from the uterus. We do not know how this acts; but it is the fact that a small artificial separation of the membranes will generally start labour within about twenty-four hours.

There are several ways of separating the membranes. The best are: (*a*) with the finger, (*b*) with a bougie. If the os uteri will admit your finger, introduce it, and move it round the lower segment of the uterus, separating the membranes as far as you can reach. The usual effect of this is that the advance of the bag of waters into the os is so helped that it soon bulges into the os, and provokes reflex uterine contractions.

This method is not often practicable, because the os uteri is not often at seven months' pregnancy large enough to admit the finger. If it be not, use a male bougie. This is commonly known as Krause's method. A bougie is better than a catheter, because it is difficult to be sure that the inside of a catheter is clean. Take a No. 10 male bougie in your right hand. Put the patient on her left side, and pass two fingers up to the cervix; guided by these fingers, pass the bougie into the os uteri, and then push it up slowly as far as it will go. When the tip is within the vagina, grasp it with the two vaginal fingers, and press it up till the button at the end lies in the external os. Then press the cervix backwards. The pressure of the posterior vaginal wall will keep the bougie in place; there is no need for any tying or plugging. In passing a flexible bougie into the uterus like this, it is quite unimportant whether it lies along the anterior or posterior wall of the uterus or along one side; you cannot guide it along either side of the uterus, nor can you tell at what part of the uterus it lies. Leave the bougie in the uterus until labour comes on. If labour pains have not begun at the end of twenty-four hours, you may conclude that the method is in the case in question a failure.

In this mode of inducing labour, not only are the membranes separated, but a foreign body is left in the uterus, and this aids the effect of separation of the membranes. Other modes of separating the membranes have been proposed, such as the injection of a large quantity of water between the membranes of the uterus. This is dangerous. A small quantity of glycerine has been used for the same purpose. This has no advantage over the bougie, and is more troublesome.

When labour has been induced by separating the membranes, either by finger or bougie, it more resembles a natural labour at term than the labour induced in any other way, except by the vaginal douche. The bag of membranes advances into the os and dilates it. The labour should be managed just like one at term. You should only interfere when conditions arise which would call for interference in any labour.

This method is more sure in its effect than Kiwisch's method, and is therefore to be preferred to it. The *disadvantages* which are attributed to it are (1) the possibility of septic infection by the bougie.

This is to be prevented by antiseptic care. Immerse the bougie in sublimate glycerine before putting it in, and after putting it in give a vaginal sublimate douche. (2) The possibility of rupture of the membranes. The membranes often do rupture too soon in premature labour, but this is because their early rupture is favoured by the conditions—contracted pelvis, etc.—for which premature labour is often induced. But sometimes it seems as if the rupture of the membranes was done by the passage up of the bougie. The way to avoid this is by passing up the bougie very slowly and gently. (3) It is said that with the bougie you may wound the placenta or separate part of it. This is to be avoided by gentleness. If you pass the bougie up slowly, it will take the path of least resistance, and find its way round the placenta. As it is not often possible before delivery to find out where the placenta is, you cannot prevent injury to it in any other way than by gentleness. If you use a catheter with a stilette in it, or pass up a syringe to inject glycerine, you will be more likely to rupture the membranes or wound the placenta than if you use a flexible bougie.

The objections above-named are accidents so far preventible that they occur very rarely, and are not of much practical importance. The one real objection to this method is that it is uncertain. Usually, pains come on after the bougie has been in the uterus about twelve hours. But sometimes a bougie will stay in the uterus for days without provoking any uterine contraction. We do not know why it is that in some patients labour is easily started, while others will tolerate much interference without the ovum being expelled. If the bougie is used properly, no harm will result even should it fail, beyond the postponement for twenty-four hours, which is not a great matter. You may, if you like, combine the bougie with Kiwisch's method; but I have not found, that when the bougie failed to excite uterine action, the combination of the douche with it succeeded.

Dilatation of the cervix.—If the above described methods of inducing labour fail, you are reduced to choose between two plans, (*a*) rupture of the membranes, and (*b*) artificial dilatation of the cervix. I have stated above in what cases I think that rupture of the membranes should be chosen: I refer to it again here, to say that in no other cases but those requiring haste should labour be induced by rupturing the membranes; artificial dilatation of the cervix is much preferable.

In most cases, in almost all first pregnancies, you will find that the cervical canal will not admit a finger. In that case begin the dilatation with a tent or tents. Pull the cervix down with a blunt volsella. Put into the cervix side by side as many tents as you can get into it, taking care they go well past the internal os. The number will depend upon the size of the tents and the size of the canal. Remove the volsella and push the cervix well back, that the pressure of the posterior vaginal wall on the os externum may keep them in. Laminaria is better than sponge, because the sponge tent gets soft so quickly that before you get the tip well through the internal os it has already begun to swell and will not make its way. This rapid expansion is an advantage when your object is to plug the cervical canal quickly, but not when you want to dilate its whole length thoroughly. Before you put in each tent, immerse it in sublimate glycerine (1 in 2,000), and after removing them use a sublimate (1 in 2,000) vaginal douche before beginning any further manipulation. Take the tents out at the end of twenty-four hours. Two tents of medium size will have dilated the cervical canal so as to admit the finger easily. Although the patient may have had some pain, yet, if the case be one in which the bougie has failed, if you take out the tents and do nothing more, the cervix will contract again. Therefore now accelerate the dilatation of the cervix.

How to hasten dilatation.—The best way of accelerating the dilatation of the cervix is by the dilating bag of Champetier de Ribes. This is made of waterproof silk, *not elastic,* so that it will hold about seventeen ounces of water and no more. Its

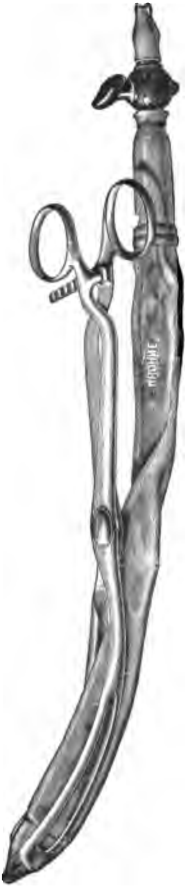

Fig. 161.—Champetier's Bag, folded, in Grasp of Forceps for Introduction.

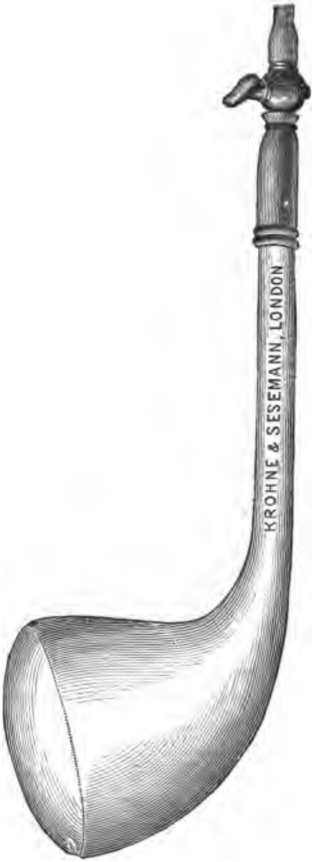

Fig. 162.—Champetier's Bag, distended.

shape is that of an inverted cone, the apex of the cone lying in the internal os, and having a tube attached to it so that water can be pumped into it. When full the base of the cone measures about three inches and a half across, so that when it can pass out the os uteri is so dilated that you can deliver immediately. You can put in the bag when the os uteri is open enough to admit a finger easily, not before. A pair of forceps is sold with it. Having first blown out the bag and washed it well with 1 in 1,000 sublimate solution, fold it longitudinally as small as you can, and grasp it with the forceps (Fig. 161). Lubricate liberally with sublimate glycerine the bag held by the forceps and pass it into the uterus. When the whole of the bag is within the uterine cavity, disarticulate the forceps and remove each blade separately. Then with an ordinary syringe slowly pump water into the bag until no more can be got in (Fig. 162). Then turn the tap, and leave the bag in the uterus. When the dilatation is complete the bag will be expelled from the uterus and afterwards from the vagina. If pains are infrequent and feeble, you can hasten dilatation by pulling on the bag.

As the bag measures three inches and a half in diameter at the base, if it is used in a contracted pelvis having a conjugate less than this, when the bag is fully expanded it may be held in the uterus by the bony contraction after full dilatation of the cervix. If two ounces of fluid are let run out of the bag after it has been filled, it can then easily be compressed till its diameter measures only two inches and a half. If you let more than this escape the bag becomes shapeless. Therefore, in using Champetier's bag for a case in which the pelvis measures less than three inches and a half in its smallest diameter, first fill the bag, and then let two ounces of water run out.

Champetier's bag has these advantages over the hitherto well-known Barnes's bags: (1) that it is more easily put in. (2) The bag when once in its place dilates the cervix to the full extent. You have not the trouble, nor the patient the suffering, caused by putting in bag after bag. (3) It does not alter its shape, and expand unequally under pressure, like a bag made of indiarubber. It is urged as an objection against its use that it displaces the head. So it does: so does Barnes's instrument. But Champetier's bag dilates the cervix so completely that after it has done its work you can deliver at once by turning, and therefore the displacement of the head is unimportant. It has also been said that there is danger of rupture of the uterus, but Champetier's bag has now been very largely used, and no case has been recorded in which either this or any other bad effect has been produced by it.

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